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Ministry of the ENVIRONMENT

Water Supply, Waste Disposal and Water Pollution Town of Bowmanville and Adjacent Areas

1972

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MINISTRY OF THE ENVIRONMENT

REPORT ON

WATER SUPPLY, WASTE DISPOSAL & WATER POLLUTION

IN THE

TOWN OF BOWMANVILLE

AND

ADJACENT AREAS

OF THE

TOWNSHIP OF DARLINGTON

COUNTY OF DURHAM

Sanitary Engineering Branch

District Engineers Section

1972

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I INTRODUCTION

Investigations were made in the Town of Bowmanville and the adjacent areas of the Township of Darlington during 1971 and 1972. This report was prepared as a result of these investigations. The report reviews the water supply and waste disposal practices in this area. The watercourses in Bowmanville were surveyed to locate existing and potential sources of pollution. Surveys of this type are made to ensure a satisfactory water quality for the many various water uses made by the people of the Province.

The field investigations provide data on conditions in the municipality, ie. water quality information, location and source of contamination, and the areas requiring sanitary services. Investigations of this type allows the Provincial government to guide the local authorities in ways to protect and preserve their streams and rivers.

The samples collected during the field investigations were submitted to the Ministry of the Environment's laboratory in Toronto for analyses and examination.

During the initial stages of this survey, the following officials were contacted; Mr. G. F. Hutchings, Chief Public Health Inspector, Haliburton, Kawartha, Pine Ridge District Health Unit, Mr. E. Archer, Superintendent of the Bowmanville Public Utilities Commission, Mr. C. E. Watt, Town Engineer, and Mr. Joseph M. McIlroy, Clerk-Administrator, Town of Bowmanville. Discussions were held with the various local officials and residents in the area. Their co-operation and assistance was most appreciated.

In the body of the report, comments are made relating to "Drinking Water Objectives" and "Guidelines and Criteria for Water Management"; a copy of these references has been enclosed in the pocket at the back of this report.

II BOWMANVILLE (T.) and DARLINGTON (TWP.)

(a) General

The Town of Bowmanville is located in the County of Durham on the north shore of Lake Ontario, approximately 36 miles east of the City of Toronto. Originally founded in 1794, the Town of Bowmanville now has an area of approximately 3,250 acres and a population of 8,862 according to the 1972 Municipal Directory. The Town sits on the north shore of Lake Ontario and is surrounded on three sides by the Township of Darlington.

Most of the development in the Town of Bowmanville has occurred along Highway #2 east of Bowmanville Creek. Development has spread north and south of Highway #2 and new development is now occurring west of Bowmanville Creek and south of Highway #2. There is some development at the present time in the areas of Darlington Township surrounding the Town of Bowmanville. The development is mostly in the form of ribbon development along Highway #2 and along the adjacent Township roads.

(b) Physical Features

The Town of Bowmanville and adjacent areas of the Township of Darlington lie in the physiographic region known as the Iroquois Lake Plain. The present level of Lake Ontario is approximately 250 feet above mean sea level (M.S.L.). The land rises from the present lake level to approximately 1,000 feet at the headwaters of Soper Creek and Bowmanville Creek. The old shoreline of Lake Iroquois is very irregular in the area north of Bowmanville. In many places the exact boundaries have not been identified. The area around

Bowmanville is made up of glacio-lacustrine deposits in the form of a lake plain. In the very north end of Bowmanville, a ground moraine deposit of mainly sandy till covers part of the area. A small swampy area of mud exists in the south end of the Town near the mouth of Bowmanville Creek. Generally, the type of soil varies throughout the lake plain area, from sand in the north to silt and clay in the southern areas.

(c) Drainage Systems

There are two main watercourses in the Town of Bowmanville: Bowmanville Creek and Soper Creek. Storm water in the Town drains to these watercourses. The effluent from two sewage treatment plants is directed to Soper Creek. Both Bowmanville Creek and Soper Creek originate north of the Town of Bowmanville in an area approximately 1,000 feet above M.S.L. and flow to Lake Ontario at a base level of approximately 250 feet above M.S.L.

Bowmanville Creek originates in Darlington Township approximately 13 miles north of Lake Ontario. Bowmanville Creek contains two major branches which meet approximately 1/4 mile south of Durham County Road #1. One branch originates near Enfield in Concession X and the other branch originates in Concession IX near Hayden. Bowmanville Creek flows in a south-easterly direction and enters the municipal limits of Bowmanville at the north-west corner of the Town. The flow tends to follow the same south-westerly direction and joins Soper Creek below Highway 401. The most notable feature of Bowmanville Creek inside the Town of Bowmanville is two dams and the ponds created by these dams. One is located at Highway #2 and the other is located opposite Goodyear Rubber Company a short distance south of Highway #2.

Soper Creek originates in Darlington Township, east of Bowmanville Creek and forms a part of the Bowmaville Creek watershed. The main branch of Soper Creek arises in the boundary area between Darlington (Concession VII) and Clarke (Concession VIII) Townships. Soper Creek has one main tributary branch known as Mackie Creek. Mackie Creek originates in the 8th Concession of Darlington Township in the vicinity of Lot #6. Soper Creek flows in a southerly direction. It follows the eastern boundary of Bowmanville until it reaches Highway #2 and then it takes a south-westerly course until it joins Bowmanville Creek.

There are flow gauging stations on both Bowmanville and Soper Creeks. The flow gauging station on Bowmanville Creek has been located at the Baseline Road approximately 1,000 feet north of Highway #401. A similar station has been located on Soper Creek at Highway #401. A summary of the minimum yearly flows during the past five years at these locations shows the following results.

TABLE I

STREAM FLOWS*

YEAR	BOWMANVILLE CREEK	SOPER CREEK
1967	17.6	8.7
1968	8.6	5.9
1969	15.0	8.8
1970	16.9	9.4
1971	17.6	**

* Stream flows reported in c.f.s.

** Flow records not available at the present time.

There are flow records available for Soper Creek starting in 1958 with information on Bowmanville Creek limited to the period from the fall of 1966. The stream flow varies between the spring runoff maximum of 225 cfs and 578 cfs and a summer minimum of 8.6 cfs and 5.9 cfs in Bowmanville Creek and Soper Creek respectively. Stream flow measurements are usually taken at least once a month on Bowmanville Creek and represent the actual flow at the particular time the recording is made. As a result, it is expected that the actual maximum and minimum flows are slightly beyond the range indicated here. The flow gauging station on Soper Creek maintains a daily record of the flows in the creek. The minimum daily discharge recorded on Soper Creek was an estimated 2 cfs on January 21 to January 31, 1961.

(d) Water Supply

The Bowmanville Public Utilities Commission is the principal water supplier in this area. In addition to the water requirements of the Town, water is supplied to the Pine Ridge School and a number of homes in Darlington Township.

The water supply for the Town of Bowmanville is obtained from three different sources. These sources include a spring supply, an artesian well and Lake Ontario. The Lake Ontario supply is the newest addition to the water supply system being completed in 1954. The spring water supply is collected in an area approximately seven miles north of Bowmanville. Locally, these springs are known as Skinner's Springs. Water from the springs flows by gravity through an 8-inch diameter line to an equalizer reservoir (2 - 150,000 gallon concrete ground level tanks) and then into the distribution system. It has been estimated that the Skinner's Springs supplies approximately 300,000 gallons per day. An artesian well at Mackie Creek flows into a 96,000

gallon ground level storage reservoir.. A dam has been constructed upstream to divert water to the reservoir during emergencies. The water from the reservoir is chlorinated and pumped into the 8-inch gravity line which flows to the equalizer. The artesian well has been rated at 32 gpm. Because of the deterioration in the raw water quality at the Skinner's Springs, a high chlorine residual in the Mackie Creek well supply is being used to treat the raw water from the springs. The mixing time in the gravity line and the equalizer provides a sufficient contact period to disinfect the raw water from the springs.

The Lake Ontario supply is obtained from waters just east of the mouth of Bowmanville Creek. Water is obtained at a depth of 19 feet below average lake level, through a 24-inch diameter steel conduit which extends approximately 1,824 feet out into Lake Ontario. A new water filtration plant, rated at 2.0 MGD is being constructed. At the present time, chlorination is the only continuous treatment provided. Alum is added by the operator when the raw water quality warrants it.

Raw Water Quality

(i) Sampling Program

A raw water sampling program is carried out by staff of the Bowmanville Public Utilities Commission. Chemical samples and bacteriological samples are submitted to the Ministry of the Environment's laboratories in Toronto. The main focus of the sampling program has been directed on the Lake Ontario water quality. No chemical samples are collected routinely from either the Mackie Creek well supply or the Skinner's Springs supply. Bacteriological samples from the Skinner's Spings supply have been included with the treated water

samples. No raw water samples from the Mackie Creek supply have been submitted routinely. During the past year, the raw water bacterial sampling program of the Lake Ontario supply has been satisfactory but we have received only one chemical sample to date.

The raw water sampling program for a municipality such as Bowmanville should include the following:

Bacterial Samples

Lake Ontario Supply - one each week

Ground Water Supply (eg. Mackie Creek well and Skinner's Springs) - one - twice each month from each source

Chemical Samples

Lake Ontario - one each month (routine analysis plus colour and turbidity)

Ground Water Supplies - one sample per year from each source (routine analysis plus fluorides and nitrates)

(ii) Bacterial Quality

During 1971, and 1972 to date, 37 and 35 samples respectively were collected from the Lake Ontario supply. At the same time, 34 samples and 37 samples respectively were collected in 1971 and 1972 to date from the equalizer but these were not marked as raw water samples and so membrane filter tests were not conducted on these samples.

A monthly geometric mean was calculated for the 1971 and 1972 results available for the Lake Ontario supply. Many of the samples collected from the equalizer were examined by the PA method and therefore geometric means could not be calculated. Bacterial distributions in nature are best described by exponential rather than arithmetical summaries and so geometric means were used to summarize the monthly counts. Table II shows the results of these calculations. The bacterial quality of the raw water was generally within our desirable criteria. Only during the months of December, 1971 and April, 1972 did the coliform bacterial level exceed our desirable criteria but the counts remainded within our permissible criteria level.

Samples collected from the equalizer reflect the water quality from the Mackie Creek artesian well and the Skinner's Springs supply during the first eleven months of 1971. During the first eight months of 1972 and during December of 1971, the chlorinated flow from the Mackie Creek well was directed to waste. A summary of the water samples collected at the equalizer during 1971 and to date for 1972 have been summarized in Table X and can be found in Appendix A at the back of this report. The sample results in 1971 were generally sa isfactory. Only two samples collected during the year were less than satisfactory. During the first eight and a half months in 1972 less than 50 per cent of the sample results were satisfactory. The results indicate that the water supply was not grossly contaminated but the water quality was unsatisfactory for use without chlorination.

* Number of organisms per 100 mls of sample.
** G.M. - Geometric Mean

TABLE II

RAW WATER BACTERIAL QUALITY

TOWN OF BOWMANVILLE

LAKE ONTARIO - WATER SUPPLY

MONTH	NO. OF SAMPLES	*BACKGROUND COLONIES (G.M.)**	*COLIFORM BACTERIA (G.M.)**
1971			
January	0	-	-
February	0	-	-
March	3	62	32
April	4	1,300	20
May	5	972	8
June	3	1,736	8
July	3	4,117	25
August	5	749	7
September	5	5,444	5
October	4	2,828	3
November	4	6,417	69
December	1	1,600	560
1972			
January	4	572	37
February	4	23	17
March	4	12	4
April	4	1,288	198
May	5	25	2
June	3	45	2
July	4	599	24
August	5	996	2
September	3	540	12

The individual results have been tabulated and are available in Tables V and VI in Appendix A.

(iii) Chemical Quality

A summary of the results of chemical samples of raw water, taken from the Lake Ontario supply in 1971 shows the following average concentrations:

CHEMICAL ANALYSES	CONCENTRATION *
Hardness	138
Alkalinity	98
Iron	0.3
Chloride	29
pH	8.2
Colour	-
Turbidity	5.5

* Concentrations reported in ppm except pH, colour and turbidity.

The chemical results for 1971 have been included in Appendix A of this report in Table VII. Our records show that only one sample was submitted to our laboratories this year by the Public Utilities Commission.

The colour reading of the raw water was 5 colour units or less. For this reason, no value was given in the above summary.

Treated Water Quality

(i) Bacterial Quality

A bacteriological sampling program of the treated water is maintained by the Bowmanville Public Utilities Commission. This is supplemented by samples collected by the Haliburton, Kawartha, Pine Ridge District Health Unit. During 1971, a total of 351 bacterial samples were collected from the distribution system by the PUC staff and the Health Unit staff. The number of satisfactory samples collected was greater than 97 per cent of the total. During the

first 8 1/2 months of 1972 a total of 396 samples were collected. The results indicate that only 66 per cent of the samples collected were satisfactory. A review of the individual sample results indicates that the change in water quality was chiefly due to the deterioration in the water quality of the Skinner's Springs supply. As a result, chlorination of this supply was initiated and some repairs to protect the springs from contamination were also made. Since the repairs and the start of chlorination, the bacterial quality of both the raw and treated water from this source has improved substantially.

(ii) Chemical Quality

At the present time, treatment consists mainly of chlorination. During periods of high turbidity in Lake Ontario, alum is added to the Lake Ontario supply by the operator. Treated water samples collected by the operator at the Lake Ontario pumphouse indicate that turbidity is usually in excess of our recommended acceptable limits. There have also been reports of sludge being observed in the water taken from the distribution system. The objective for treated water quality (physical quality objectives) suggest that "drinking water should contain no impurities which would cause offense to the sense of sight, taste or smell". Generally, the following * limits should not be exceeded:

Turbidity - 1 unit

Colour - 5 units

* See pamphlet entitled "Drinking Water Objectives" enclosed in the pocket at the back of this report.

The results of colour and turbidity readings of the treated water samples submitted to the Ministry of the Environment's labortory in Toronto during 1971 are summarized in Table III.

TABLE III

COLOR AND TURBIDITY - 1971

LAKE ONTARIO SUPPLY - TREATED WATER QUALITY

DATE	COLOR	TURBIDITY
18/1	L 5	4
4/2	L 5	3
3/3	L 5	8
15/3	L 5	8
5/4	5	12
3/5	L 5	4
31/5	15	4
12/7	L 5	3
2/8	L 5	3
7/9	L 5	3
13/12	L 5	4

L = less than

Approval has been given for the construction of a 2.0 MGD filtration plant at the Lake Ontario pumping station under approval certificate 7-0890-69-726. Construction has started and it is anticipated that the new filtration plant which should be operational in 1973, will lower the turbidity in the treated water substantially and thus meet our objectives.

(e) Waste Disposal

(i) Sewage Treatment & Disposal

There are two sewage treatment plants and collection systems in this area. One serves the Town of Bowmanville and provides secondary degree treatment. The other is a small extended aeration plant serving the Pine Ridge School which is located just outside of the Town of Bowmanville's eastern municipal boundary. In the remaining areas, the disposal of sanitary wastes is achieved through individual sub-surface disposal systems.

(ii) Bowmanville Sewage Treatment Facilities

The sewage treatment facilities serving the Town of Bowmanville include two sections. They have common preliminary treatment facilities and they discharge to a common chlorine contact chamber and outfall. The old section, completed in 1947, uses the biofiltration process for treatment. A new section uses the activated sludge process and was built in 1960. The sewage treatment facilities have a rated capacity of 1.5 MGD. Flows in excess of 3.75 MGD would have to be bypassed at this plant. Since November 1971, the bio-filter section of the plant has been used infrequently because the filter has been clogged. As a result, all sewage flows to the plant have been directed to the activated sludge section for treatment.

During the past few years there has been problems with the operation of these sewage treatment facilities. Plant physical deficiencies, equipment breakdown, and lack of adequate personnel, plant maintenance, etc. all have contributed to operational problems at the plant. Because of these

conditions, it has resulted in an effluent of less than satisfactory quality being discharged to Soper Creek (See Appendix B).

The operating staff at the sewage treatment facilities collect sewage samples from various locations throughout the treatment processes. A summary of the raw sewage and the final effluent analyses is contained in Table XII, Appendix B, for 1971 and 1972 to date. The table also shows the overall efficiency of the treatment facilities plus the actual raw and effluent sewage strengths. The following information was obtained from Table XII:

TABLE IV

OPERATING EFFICIENCY

SEWAGE TREATMENT FACILITIES

	PERCENT REDUCTION IN BOD	PERCENT REDUCTION IN SUSPENDED SOLIDS
1971 - PUC SAMPLING PROGRAM*		
Maximum	94	99
Minimum	57	73
Average	82	87
1972 - PUC SAMPLING PROGRAM*		
Maximum	91	95
Minimum	55	33
Average	64	62

* Grab samples only.

These results indicate that the treatment which was poor in 1971 has further deteriorated in 1972. During 1972, the trickling filter was out of operation most of the year because of a clogging problem. An enzyme treatment was

used in an unsuccessful attempt to clean the filters and thus correct the ponding problem. The efficiency of the biofiltration process is normally slightly less than the activated sludge process and as a result some improvement in the overall effluent quality should have been apparent during the period when the trickling filter was down for repairs. There was no apparent improvement in the removal efficiency. It is believed that peak flows during periods of heavy runoff and perfunctory supervision were responsible for the problem of maintaining an adequate concentration of solids in the activated sludge. This would account for the lower removal efficiency.

The effluent quality from single stage high rate trickling filters (biofiltration process) is subject to greater seasonal variation than in an activated sludge plant. The best BOD_5 removals in trickling filters occur in the summer months and the poorest in the winter months. The suspended solids removal efficiency is usually best in the late fall. The advantage of the activated sludge process is that this process shows very little seasonal variation in the effluent quality. There is some falloff in BOD_5 effluent quality in the late fall as the micro-organisms are aclimatized to the colder weather but generally the effluent quality remains very consistent. It is usually possible to operate at removal rates for BCD_5 and suspended solids of 85 to 90 per cent at trickling filter plants and 90 to 95 per cent at activated sludge plants. In Appendix B at the back of the report, a summary of the operating efficiencies of the activated sludge plant and the trickling filter plant has been compiled in Table XIII. These figures indicate the following efficiences:

YEAR	TRICKLING FILTER PLANT		ACTIVATED SLUDGE PLANT	
	BOD_5	Suspended Solids	BOD_5	Suspended Solids
1970	71	76	90	90
1971	81	85	84	87
1971*	54	66	77	64
1972	-	-	59	61

* Results of study of operations by OWRC staff.

In May 1971, a detailed study was made of the operation of the municipal sewage treatment plant and a report was sent to the authorities responsible for the operation of the facilities. During the study, a 48-hour composite sampling program was conducted by staff of the OWRC. The results of the sampling program indicated the following overall reductions in BOD_5 and suspended solids:

1971 - 48-HOUR COMPOSITE SAMPLING PROGRAM

	PERCENT REDUCTION IN BOD_5	PERCENT REDUCTION IN SUSPENDED SOLIDS
Maximum	76	75
Minimum	58	67
Average	69	70

These results indicate the efficiency of the sewage treatment facilities during the aforementioned study was substantially less than obtained for the year 1971 based on the PUC sampling program. One reason for the difference may have been that the samples collected by the PUC were "grab-type" samples whereas the 48-hour study involved 8-hour "composite" samples. Because of the nature of grab samples, there is a greater fluctuation in the results. Grab samples do not reflect as accurate a picture of the overall efficiency

of the treatment. They give the actual conditions at the time of sampling. Therefore, a combination of grab and composite samples should be used to assess the performance of the sewage treatment facilities. The results of the 48 hour study confirmed actual field observations, that the plant was not operating efficiently.

The quality of the effluent from this sewage treatment plant has not been satisfactory because of the previously mentioned problems. It is normally expected that secondary treatment will produce an effluent having a BOD_5 and Suspended Sclids concentration not greater than 15 ppm. The summary of results in Table XII shows that the BOD_5 concentration and suspended solids concentration in the effluent were as follows:

YEAR	*BOD_5			*SUSPENDED SOLIDS		
	Maximum	Minimum	Average	Maximum	Minimum	Average
1971	25	15	25	40	5	19
1972	100	12	40	60	5	33

* Results reported in ppm.

During the 48-hour study, the effluent averaged a BOD_5 of 26 ppm and suspended solids concentration of 24 ppm in the composite samples. An assimilation study has been made by our Water Quality Branch of Soper Creek. Their study revealed that "the organic waste loading from the Bowmanville sewage treatment plant significantly depletes the oxygen resources of Soper Creek". They have calculated from this study that Soper Creek is capable of assimilating about 200 pounds of BOD_5 per day under drought flow conditions without depressing the dissolved oxygen level below 5.0 mg/l. Upstream sources appeared to account for 50

pounds BOD_5 per day leaving 150 pounds BOD_5 per day for the municipal sewage treatment facilities. During the 1971 study, the BOD_5 concentration in the effluent averaged 26 ppm with an average day flow of 0.743 MGD this equals a BOD_5 loading of 193 pounds from the sewage treatment facilities. In Appendix B, the BOD_5 loading from the these facilities has been calculated at design flow based on an average sewage strength of 200 ppm BOD_5 and the expected removal efficiency for the type of treatment provided. These calculations show that at design capacity, the BOD_5 loading from these facilities will exceed the assimilative capacity of the stream. However, by 1975, special facilities for phosphorus removal will be in operation and it is expected that the plant BOD_5 removal efficiency will improve accordingly and under these new conditions the BOD_5 loading from the plant will not exceed the assimilative capacity of the stream. Under the present actual organic loading conditions, the BOD_5 loading from the Bowmanville sewage treatment facilities would be as follows:

Present Loading Conditions

Raw Sewage Strength	-	159 ppm
Raw Sewage Flows	-	0.743 MGD
Activated Sludge (optimum removal efficiency)	-	at 95% reduction (not obtained in 1971 and most of 1972)
Therefore, stream loading =		59 lbs. BOD_5

If we use the actual BOD_5 removal removal efficiency of about 70% obtained in 1971 and part of 1972, the BOD loading to the stream amounts to about 350 lbs./day

Assuming design flow of 1.5 MGD for the complete sewage treatment facilities

1.0 MGD Activated Sludge 95% reduction	=	79.5 lbs. BOD_5 +

0.5 MGD Trickling Filter
90% reduction = 79.5 lbs. BOD_5

Therefore, total BOD_5
loading = 159 lbs.

These figures indicate that even under the present loading conditions, the sewage treatment facilities will have to be operated at the highest removal operating efficiency to protect the stream quality.

There has been discussions related to conversion of the trickling filter plant to an activated sludge plant. This may produce a slightly better effluent but only under the most optimum operating conditions could the plant be expected to produce an effluent which would not exceed the calculated stream assimilated capacity during drought flows. The long term solution to this problem is construction of an outfall to Lake Ontario. The construction of such an outfall will be a condition associated with expansion of this plant in the future.

A monitoring station is located on Soper Creek at West Beach Road just below the CNR tracks. The dissolved oxygen levels in the creek at this point during the past three years and the first nine months of 1972 were as follows:

	*DISSOLVED OXYGEN CONCENTRATIONS		
YEAR	MINIMUM	MAXIMUM	AVERAGE
1972	6.2	12.6	9.8
1971	5.0	11.0	8.5
1970	5.0	11.0	8.0
1969	6.0	11.0	9.2

* Concentrations in mg/l.

These tests are made approximately once each month. It should be noted that this location does not necessarily represent the area where the effluent from the sewage treatment facilities has its maximum effect. It is expected that the lowest oxygen depression in the stream, will occur downstream of West Beach Road. These figures indicate that the dissolved oxygen levels are at times quite low and would not be favourable to certain native biota (see page 8, Guidelines and Criteria for Water Quality Management in Ontario).

(iii) Pine Ridge School - Sewage Treatment Facilities

The Pine Ridge School treatment plant is located approximately two miles upstream of the Bowmanville municipal sewage treatment plant. The Pine Ridge School complex is served by a modified activated sludge package sewage plant. The sewage treatment plant is rated at 0.048 MGD.

During 1971, the average daily flow was equal to 0.023 MGD with an average BOD_5 in the effluent of 20 ppm. This represents a stream loading rate of 4.6 lbs. BOD_5 per day. The percent reduction in BOD_5 and suspended solids was 84 and 77 per cent respectively. The percent reduction in suspended solids improved over the 1970 results and the concentration of suspended solids in the effluent was also lower (see Table XVII, Appendix B). Although the percent reduction in BOD_5 was the same, the actual concentration in the effluent was improved.

Samples collected during the first ten months of 1972 shows a deterioration in the effluent quality. Both the percent reduction and the concentration of BOD_5 in the effluent had deteriorated. The average suspended solids

concentration has dropped but the percentage reduction has also dropped. The operating authority should give greater attention to the daily plant operations. The effluent quality does not always meet our objectives and the treatment efficiency is below normal levels.

(iv) Private Domestic Waste Disposal

There are areas in the Town of Bowmanville which are not served by the municipal sewage treatment facilities. In these areas and in the surrounding Township, disposal of sanitary wastes is generally achieved through individual sub-surface disposal systems.

One such area is along Lake Ontario. These homes are reportedly to be for summer use only but some are being occupied as year-round residences. As a result, problems have been encountered with some of the sewage disposal systems. Holding tanks have been installed on some properties to correct known problems. Even in areas where sanitary sewers are available, there are a number of residences which still retain their sub-surface disposal system. This is mainly because the homes are too low to make a simple connection to the sanitary sewer. A small residential area west of Scugog, north of R. M. Hollingshead Corporation (Canada) Limited, has recently received approval for the installation of sanitary sewage services. The local health unit had reported to the municipal officials that there were problems with sub-surface disposal systems in this area. This area has a clay and silty type soil and therefore, if extreme care is not exercised in the design, installation and operation, problems are bound to occur.

It has been brought to our attention that some water quality problems exist with individual well supplies, and some industrial waste disposal systems in an area of Darlington Township at Lots 21 and 22, Concession II, which is located between the Hamlet of Maple Grove and the Town of Bowmanville. Staff of the Ministry of the Environment has been co-operating with staff of the Haliburton, Kawartha, Pine Ridge District Health Unit to investigate and to advise the area residents in regard to the above mentioned problems.

(v) Industrial Waste Disposal

In the Town of Bowmanville and the adjacent areas of the Township of Darlington considered in this report, all industrial sources of wastewater except cooling waters are discharged to the municipal sewage collection system of the Town of Bowmanville. In the Town of Bowmanville, the major industries are Goodyear Rubber Company Limited and R. M. Hollingshead Corporation (Canada) Limited. Cooling waters from both industries are discharged to Bowmanville Creek. Sample results from their outfalls show that the effluent quality was generally satisfactory (see Tables XIV(a), and (b), XVII(a) and (b) in Appendix C). In the Township of Darlington just west of Bowmanville, the St.Mary's Cement Company Limited has a crushing plant in operation. Cooling water from the plant is discharged to a small creek which flows into Lake Ontario. Drainage from the quarry operation is also discharged to this creek. The Industrial Waste Branch of this Ministry reports that wastewater from this operation has been satisfactory for discharge to surface waters.

(vi) Solids Waste Disposal

The Town of Bowmanville operates a sanitary landfill site on the west side

of Bowmanville Creek just north of Jackman's Road. The Waste Management Section of this Ministry makes routine inspections of sanitary landfill sites in the Province. They report that the Bowmanville site is being operated satisfactorily. The present site is nearing capacity and it is anticipated that the present site will reach capacity in approximately one year's time.

At the present time, the Town of Bowmanville is operating a refuse dump (clean material only) on the east side of Soper Creek just south of Highway 401. This site is presently being reviewed to determine its acceptability.

III WATER POLLUTION SURVEY

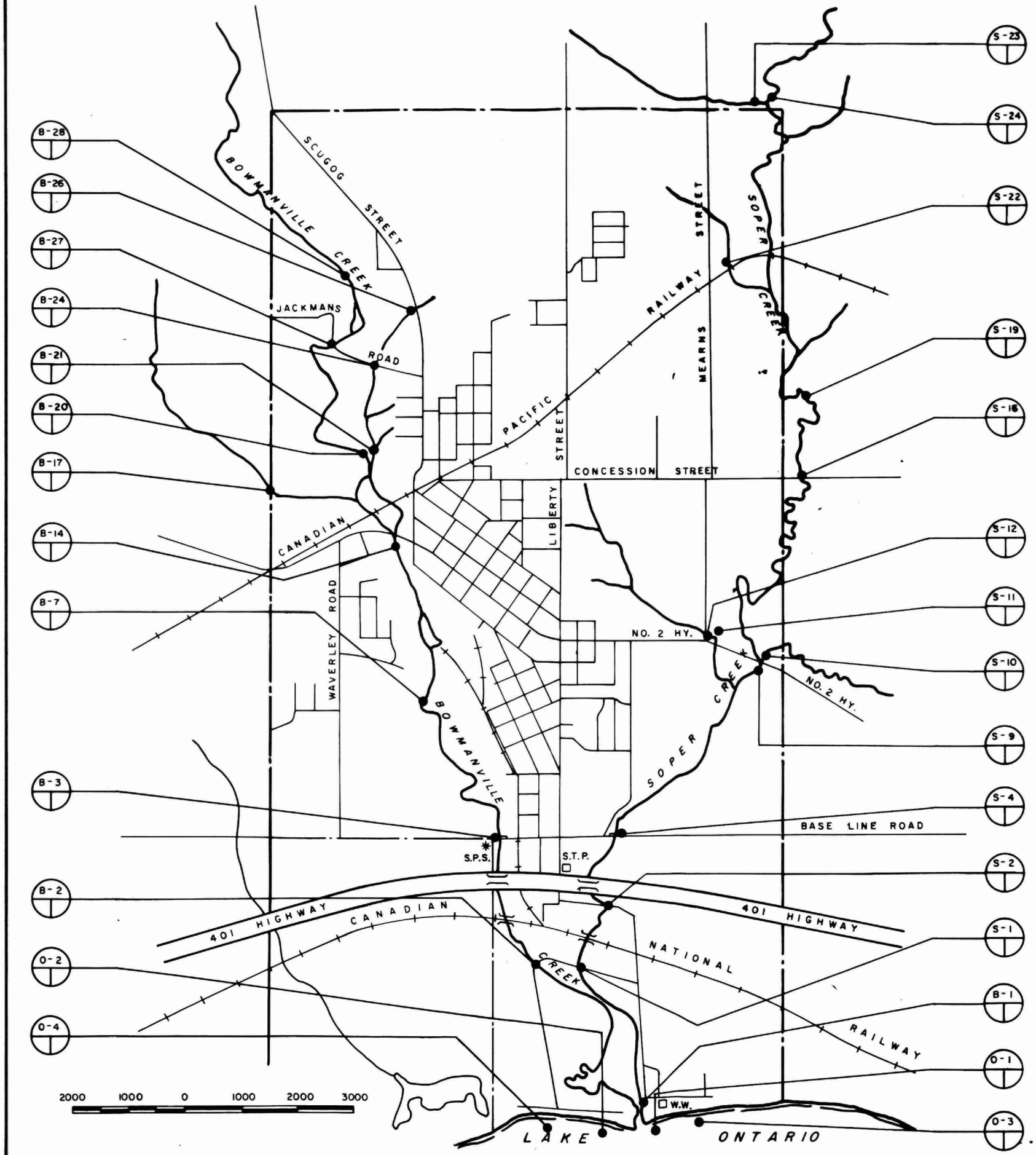
(a) General

Samples were collected from Soper Creek and Bowmanville Creek as well as any evident discharges to these creeks. Two maps have been prepared, one shows the stream sampling locations (see page 25) and the other shows the outfall sampling locations (see page 28). The Ministry of the Environment's laboratory in Toronto performed all bacteriological examinations and sanitary chemical analyses on the samples. The results of the tests are recorded in Tables XVIII through XXIII in Appendix C to this report. An interpretation of the laboratory results is given in Appendix D.

Our objective for surface waters are described in the booklet entitled "Guidelines and Criteria for Water Quality Management in Ontario". A copy of the booklet is enclosed in the pocket on the back cover of this report. The publication contains guidelines and introduces water quality criteria for various uses including public, agricultural, and industrial water supply, recreation, aesthetic enjoyment and the propogation of fish and wildlife. The guidelines should be followed to determine the acceptability of a watercourse for various uses.

(b) Soper Creek

Samples were collected from Soper Creek starting just north of the Town of Bowmanville's boundary line. A map on page 25 shows the stream sampling point locations. The results shows a gradual change in the water quality as drainage from the town is collected and mixed with the stream water. The water quality



LEGEND

S-17 - SAMPLING POINT SHOWING STREAM.

* SEWAGE PUMPING STATION

ENVIRONMENT ONTARIO

TOWN OF BOWMANVILLE

STREAM SAMPLING LOCATIONS

1972

SCALE: 1 INCH = 2000 FT	
DRAWN BY: A. J. H.	DATE: JULY 1971
CHECKED BY: J. C.	DRAWING NO: 71-71-DE

was generally within the expected ranges, considering the type of area being drained. The greatest portion of the area surveyed has relatively little development along its banks.

The stream sample results show that problems at the Bowmanville sewage treatment facilities had the most impact on the water quality. The bacterial quality varied throughout the length of the creek but the greatest bacterial populations occurred in the area near the mouth of the creek (see Tables XVIII(b) and XXI(b)). In areas above the Bowmanville sewage treatment facilities the results indicate that sources of bacterial contamination were from animal rather than human sources. The chemical analyses indicate that the BOD_5 was high in the areas downstream of the municipal sewage treatment facilities. In the remaining areas, the BOD_5 of Soper Creek was very good. Tributary creeks were contributing very little to the BOD_5 loading on the main stream during the times when samples were collected. There was some high nutrient values in the chemical results but these generally reflect loadings from the Pine Ridge School sewage treatment facilities and the Bowmanville municipal sewage treatment facilities. The storm sewers along Soper Creek did not contribute substantially to the loading on the creek. Some of the samples collected showed high concentrations of BOD_5 and nutrients but the actual flows from the sewers were very small. Some of the outfalls discharged to drainage ditches which were quite remote from the creek and these flows probably never reached the creek unless there was an extremely heavy runoff. A map on page 28 shows the locations of the outfalls examined during this survey. The storm sewer on the west side of Soper Creek at Baseline Road has on at least one occasion contained waste products but the waste has not appeared again after the first sample was collected. On the east side of Soper Creek at Baseline Road, there is an outfall under

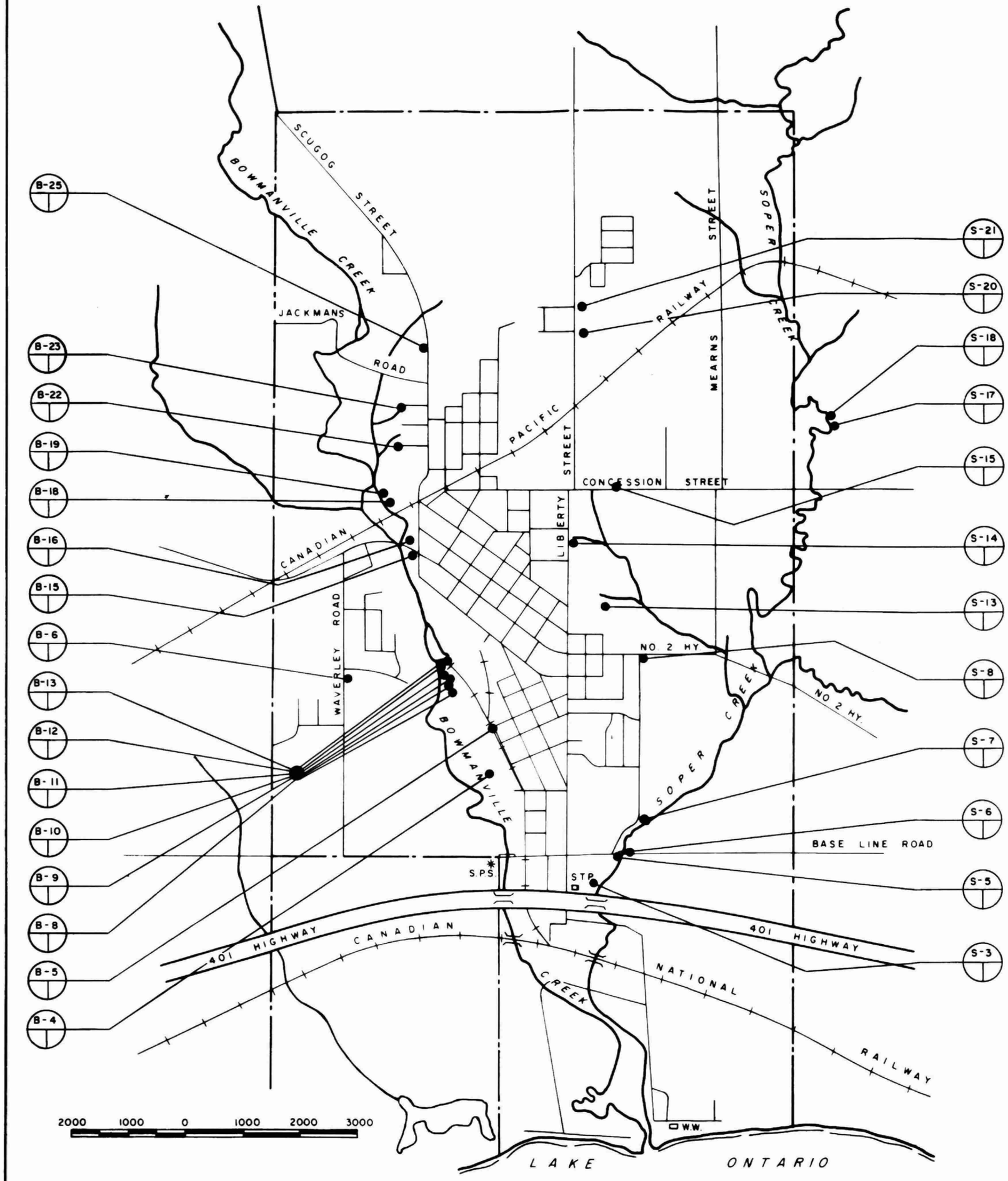
the bridge which has been designated as a storm sewer. This is inaccurate in that it is an overflow from a sewage pumping station. On May 10, 1971, samples were collected of the overflow from the sewage pumping station. The effluent quality of the wastewaters (storm waters, ground waters, cooling waters, etc.) in the remaining outfalls along Soper Creek were within the expected ranges. In several storm sewers, high chloride concentrations were noted (see Tables XVIII(a) and XXI(a), in Appendix C), but in other respects the results are typical for the area.

(c) Bowmanville Creek

Samples were collected from Bowmanville Creek and the outfalls discharging to the creek. The maps on pages 25 and 28 show the extent of the sampling program.

The results of the sampling program indicate that the water quality was generally satisfactory throughout the length of the creek. At the mouth of Bowmanville Creek, the BOD_5 level shows a definite increase as a result of flows from Soper Creek. The primary cause being the effect of the municipal sewage treatment facilities. The total phosphorus level is also very high in this area. This is caused by the marshy area and inputs from the sewage treatment plants on Soper Creek.

Generally, the turbidity level in Bowmanville Creek was much higher than Soper Creek during the 1972 sampling run. In the area above the confluence with Soper Creek, the turbidity varied between 35 - 70 units. This is due in part to construction on a Township road which runs parallel to the Bowmanville-Darlington Township border. In addition, lowering of the water level behind



LEGEND

S - 17 - SAMPLING POINT SHOWING STREAM.

* SEWAGE PUMPING STATION

ENVIRONMENT ONTARIO	
TOWN OF BOWMANVILLE OUTFALL SAMPLING LOCATIONS 1972	
SCALE: 1 INCH = 2000 FT	
DRAWN BY: A J H	DATE: JULY 1971
CHECKED BY: J. C.	DRAWING NO: 71-71A-DE

the dam on Highway #2 resulted in erosion of the bottom deposits thus causing a turbidity problem. The bacterial quality was generally satisfactory throughout the length of the creek during the four sampling runs.

Most of the industrial discharges are directed to Bowmanville Creek. These flows are cooling waters. The sample results indicate generally satisfactory quality.

A similar situation with regard to chloride concentrations in the storm sewers on Bowmanville Creek can be seen in the chemical report in Tables XIX(a) and XXII(a). In other respects, the effluent quality was satisfactory in the storm sewers. One small exception to this was found in a storm sewer outfall at Highway #2 on the east side of Bowmanville Creek. The sample results indicated the presence of sanitary wastes during periods of high flow in the sanitary sewer system. Corrections have been made to prevent any further overflows to this storm sewer outfall.

(d) Lake Ontario

Samples were collected along the shoreline of Lake Ontario around the mouth of Bowmanville Creek. The laboratory results have been summarized in Tables XX(a) and (b) and XXIII(a) and (b) in Appendix C at the back of this report. The bacterial quality of the water was generally satisfactory. The chemical report on the water quality indicates that the water is fairly enriched but in other respects the chemical quality was satisfactory.

The sample results vary greatly between each sampling run. The samples collected in 1971 were similar to the results obtained in August, 1972. Whereas the

results obtained in August 1971 showed much poorer quality.

During August 1971, there was an abundance of aquatic plants growing in the waters along the shoreline of Lake Ontario in this area. But because of the very high water level of Lake Ontario this year the same problem has not developed.

The raw water sampling programme which monitors the Lake Ontario municipal water supply provides a good indication of the lake water quality in the shallow areas (see Tables V, VI and VII). As indicated in this report, the raw water bacterial quality was generally within our desirable criteria except during December 1971 and April 1972. The chemical quality was satisfactory.

IV FUTURE SANITARY REQUIREMENTS

(a) General

The Town of Bowmanville is presently undergoing growing pains. Development through the years has steadily increased the population of the Town to 8,862. During the past ten years, population has increased by approximately 1600 persons. The present proposed residential development if all approved and developed, will see the population increase by more than 50 per cent. The demand for sanitary services will tax the town's existing facilities and plans for increasing the water works and sewage works capacity should be under review. Perhaps a control schedule of creation of new lots should be developed and adopted in conformity with the capacities of the water and sewage works and with the intent of the Town's Official Plan.

(b) Future Water Works Requirements

The present water supply facilities are operating at 64 per cent of their rated capacity. The Ministry of Treasury, Economics and Intergovernmental Affairs has forwarded to our office proposed plans for residential development which will require the bulk of the existing water supply reserve capacity to serve these new developments, if approved.

The Town of Bowmanville was given approval by the Ministry of the Environment on October 17, 1972 to construct a 2.0 MGD filtration plant. This will not increase the water supply capacity but will only improve the treated water quality from the Lake Ontario supply (make it more palatable). A

sampling program has been initiated to determine the phytoplankton densities and types, so that the most appropriate design of the filter media for the present plant and for future pre-treatment facilities, can be chosen. Once the final design of the filter media has been made, the rated capacity of the units can be re-evaluated. It is possible that the present rated capacity of the currently approved facilities may be increased slightly.

Discussions have been held with the Town of Bowmanville municipal officials regarding the Town's capability of supplying water to the growing number of consumers. Information supplied by the Town shows that the present water supply works are not capable of meeting the demands of all the development now being proposed. This has been explained to the Town of Bowmanville municipal officials. As mentioned previously, the municipal officials should establish a schedule of creation of new lots in line with the capacity of its water works and also in line with the Town's Official Plan.

(c) Future Sewage Works Requirements

The present sewage treatment facilities serving the Town of Bowmanville have adequate capacity but have been providing inadequate treatment. Better operation of the facilities will allow the sewage works to accept flows within the present design capacity without overloading the receiving stream. In addition, treatment facilities for improved phosphorus removal will be required by December 31, 1975 in accordance with the previous announced phosphorus removal program. Of great importance is the repair and return to operation of the trickling filter section or the conversion of this section to an activated sludge section.

There are some problems in the sewage collection system which causes overflows, from the sanitary sewer system, to run into Bowmanville Creek and Soper Creek without treatment. There are also two areas in the Town which have encountered problems with sub-surface disposal systems. One area is north of Highway #2 and west of Scugog Street and the other area is along Lake Ontario. Approval has already been given for the installation of sanitary sewers in the area west of Scugog Street. The other area is isolated from the existing sewage collection system and would be very costly to serve.

(i) Sewage Treatment Plant

At the present time, the existing sewage treatment facilities have adequate capacity to serve the present development as well as the proposed development which we have reviewed to date. The main problem at the present time is related to the operating problems mentioned on page 13 of this report. The resulting effect has been impairment of the downstream water quality in Soper Creek and Bowmanville Creek. The trickling filter section of the treatment facilities has been experiencing ponding problems and thus has been taken out of operation. An enzyme chemical treatment of the filter bed has not been successful in resolving this problem. The filter media will have to be removed to determine the exact cause of the clogging and ponding problem. Corrections will subsequently have to be made.

The results of an assimilation study of Soper Creek made in 1971 has already been discussed on page 17 of this report. The plant will have to be operated at optimum efficiency if the plant effluent is not to overload the stream's

assimilative capacity. The present raw sewage strength is 159 ppm BOD_5. If the facilities were operated at optimum efficiency, the stream loading (5-Day BOD) would equal the maximum permissible loading at low flow conditions when the plant reaches its design flow. When the facilities are operating at design flow, there will be less than a 3:1 dilution ratio (see Table I) at periods of low stream flow. Because of these facts, any further expansion of the facilities without a corresponding increase in the removal efficiency (percent reduction BOD_5) will result in the watercourse being overloaded. One solution to the problem would be to construct an outfall from the present site to Lake Ontario. Another alternative would be to select a second more suitable site for a second sewage treatment plant. It is important that this aspect be reviewed well in advance so that if it is necessary, changes can be made to ensure proper zoning and to protect the site from encroaching development.

(ii) Phosphorus Removal

In April 1971, the Province of Ontario, through the Ontario Water Resources Commission set forth a program for the installation of phosphorus removal facilities at various sewage treatment plants in the Province. The sewage plant at Bowmanville should have phosphorus removal facilities installed and operating by the end of 1975. The phosphorus removal program will require that the designated plant be able to reduce the phosphorus concentration in the effluent to 1 ppm or less. Each treatment plant will require a separate pilot study to determine which of the various chemicals and treatment methods available suits their operation. As a result of an agreement between the Federal and Provincial governments, assistance has been made available to meet the cost of treatability studies. It is expected that with nutrient

removal facilities installed, the overall quality of the effluent will be further improved.

(iii) Sewage Collection

There are two areas in the Town of Bowmanville which have in the past had problems with sub-surface disposal systems. Samples collected during the survey did not substantiate any problems in these areas. The local health unit prepared a report and presented it to Council last winter outlining problems in the area west of Scugog Street and north R. M. Hollingshead Corporation (Canada) Limited. A combination of clay silty soil and a high water table has been partially responsible for these problems. At the present time, approval has been given for the construction of sanitary sewers to serve this area. It has been reported that construction has been initiated in this area.

The area adjacent to the mouth of the Bowmanville Creek has cottage development. Many of the properties particularly near the mouth are located on extremely small lots. Some problems have been reported and have been corrected through holding tanks. The installation of sewers in this area would be very costly at the present time. The municipality should enforce existing by-laws to control occupancy in this area when sub-standard sewage disposal systems are being employed for year-round use.

During the field investigations, overflows from the sanitary sewer system were noted at two locations. Corrections have been made at Bowmanville Creek and Highway #2 and no further problems should occur here. At the other location, the pumping station was overloaded by spring runoff. An investigation should be made to determine whether excess quantities of ground or surface

water are gaining access to this sewer. An alarm system should be installed to monitor the overflows at all locations in the collection system where it is possible for sewage to discharge directly or indirectly to a watercourse. This information should be used to determine the cause of the overloading and steps should be taken to reduce the frequency of overflows to a minimum.

V SUMMARY AND CONCLUSIONS

This report reviews the water supply, waste disposal and water pollution conditions in the Town of Bowmanville and in the adjacent areas of the Township of Darlington. The field investigations were carried out in 1971 and in 1972 and the preparation of the report was completed in 1972.

The results of the survey indicate that most of the problems were related to the operation the sewage treatment facilities. Also, two sources of sanitary wastes were identified and a third possible source was found but subsequent sampling did not confirm the original results. Generally, the water quality in both Soper Creek and Bowmanville Creek was satisfactory except in the areas effected by the Bowmanville municipal sewage treatment facilities.

Proposed development in the Town of Bowmanville is rapidly overtaking the Town's ability to supply water and to supply sanitary sewage treatment. If all the present proposed development is approved, this will require more capacity than available at present from the existing water supply systems. The present sewage treatment facilities will barely be adequate to serve the proposed development we have reviewed to date. No further expansion of the sewage treatment facilities at the existing site can be considered unless an outfall is constructed to Lake Ontario.

There are areas of development in the Town of Bowmanville and in the Township

of Darlington where problems with individual water and sewage services have been experienced. If correction of the problems on an individual basis is found to be not feasible, the provision of municipal services in these areas will have to be considered in the future.

VI RECOMMENDATIONS

Town of Bowmanville

Water Works

1. The municipal officials should establish a schedule for the creation of new lots in line with the capacity of its water supply facilities and also in consideration of the terms of the Town's Official Plan.

Sewage Works

1. Recommendation #1 for "Water Works" is also applicable in relation to the Town's sewage treatment facilities.

2. All points in the sewage collection system which have overflow arrangements should be equipped with monitoring devices to record the frequency of overflows and all overflow occurrences should be reported to this Ministry.

3. A study to determine the best phosphorus removal treatment method for the Bowmanville municipal sewage treatment facilities should be made.

4. The municipal officials should review their plans for future expanded sewage treatment facilities. They should consider the advantages and/or disadvantages of constructing an outfall to Lake Ontario from the present site versus the selection of a second site to serve future development.

5. Steps should be taken to make the necessary repairs to the trickling filter as soon as possible and to return this unit and section to proper operation. Alternatively, consideration could be given upon the advise of this Ministry and the Town's consultant, to convert the present trickling filter to an activated sludge unit.

6. The present sewage treatment facilities should be maintained in a good operating condition and the control of the treatment processes should be supervised in such a manner as to obtain optimum treatment efficiency at all times.

7. The entry of storm or ground water to the sanitary sewer system should be kept to a minimum to reduce surges in sewage flows which are being received at the plant during periods of rainfall and during the period of spring runoff.

Pine Ridge School

1. The operation of the sewage treatment facilities serving the school should be supervised in such a manner as to obtain optimum treatment efficiency.

Township of Darlington

1. Any future development adjacent to Bowmanville on the basis of individual services should be carefully controlled and preferably discouraged since these could create servicing problems in the long term.

Prepared by:.....
J. A. Clarke
District Engineers Section
Sanitary Engineering Branch

/cs

APPENDIX A

WATER SUPPLY

WATER QUALITY SUMMARY

Table V - X

TABLE V *Bacteriological Results 1971.

RAW WATER QUALITY

TOWN OF BOWMANVILLE - MUNICIPAL WATER WORKS

LAKE ONTARIO SUPPLY

DATE (d/m)	BACKGROUND COLONIES	COLIFORM BACTERIA	DATE (d/m)	BACKGROUND COLONIES	COLIFORM BACTERIA
8/3	1,100	146	2/8	50,000	22
15/3	54	16	10/8	0	0
23/3	4	-	16/8	2,800	-
29/3	-	14	23/8	2,100	6
			30/8	800	22
5/4	-	60			
12/4	-	60	7/9	5,600	6
19/4	-	46	13/9	28,000	0
26/4	1,300	0	20/9	5,000	16
			27/9	11,200	6
3/5	46	8			
10/5	32	0	4/10	2,000	2
17/5	68	2	14/10	5,800	2
25/5	398	142	18/10	24,000	2
31/5	214	14	25/10	230,000	16
7/6	156	6	1/11	6,800	24
14/6	560	0	8/11	22,000	302
28/6	60,000	86	15/11	4,200	22
			22/11	2,200	144
5/7	9,400	106			
12/7	12,800	12	13/12	1,600	560
26/7	580	12			

* Number of organisms per 100 mls of sample.

TABLE VI

*Bacteriological Results - 1972

RAW WATER QUALITY

TOWN OF BOWMANVILLE - MUNICIPAL WATER WORKS

LAKE ONTARIO SUPPLY

DATE (d/m)	BACKGROUND COLONIES	COLIFORM BACTERIA	DATE (d/m)	BACKGROUND COLONIES	COLIFORM BACTERIA
3/1	1,800	348	13/6	24	0
17/1	5,600	700	20/6	36	-
24/1	70	4	27/6	106	4
31/1	152	2			
			4/7	272	0
7/2	24	6	11/7	4,800	548
14/2	78	28	18/7	430	40
21/2	76	16	25/7	230	14
29/2	2	30			
			1/8	198	2
7/3	142	18	8/8	44,000	6
14/3	2	0	15/8	234	0
21/3	64	24	28/8	438	2
28/3	0	0	29/8	1,100	6
5/4	1,000	76	5/9	1,280	6
11/4	21,200	2,200	12/9	948	16
18/4	13,000	4,600	19/9	130	16
26/4	10	2			
2/5	18	2			
9/5	14	8			
16/5	0	0			
23/5	226	4			
30/5	172	0			

* Number of organisms per 100 mls of sample.

Concentrations reported in ppm except pH, colour and turbidity.

TABLE VII

RAW WATER QUALITY

TOWN OF BOWMANVILLE - MUNICIPAL WATER WORKS

LAKE ONTARIO SUPPLY

DATE (d/m)	HARDNESS as $CaCO_3$	ALKALINITY as $CaCO_3$	IRON as Fe	CHLORIDE as Cl	pH at Lab	APPARENT COLOUR	TURBIDITY
18/1	140	96	0.10	28	8.1	L 5	3
4/2	144	98	0.20	29	8.1	L 5	4
3/3	140	96	0.30	30	8.2	L 5	4
15/3	142	101	0.30	31	8.1	L 5	6
5/4	142	110	1.50	30	8.3	5	25
3/5	138	98	0.10	28	8.4	L 5	3
31/5	134	97	0.15	28	8.3	15	4
12/7	136	99	0.05	28	8.1	L 5	3
2/8	132	93	0.10	29	8.2	L 5	1.5
7/9	132	94	0.30	29	8.0	L 5	3
13/12	140	100	0.20	29	8.0	5	4
MAXIMUM	144	110	1.50	31	8.4	15	25
MINIMUM	132	93	0.05	28	8.0	L 5	1.5
AVERAGE	138	98	0.30	29	8.2	-	5.5

L = less than

TABLE VIII

TREATED WATER QUALITY

TOWN OF BOWMANVILLE - MUNICIPAL WATER WORKS

BACTERIOLOGICAL RESULTS - 1971

HEALTH UNIT SAMPLING PROGRAM

MONTH	NO. SAMPLES	NO. SATISFACTORY	NO. DOUBTFUL	NO. UNSATISFACTORY
January	11	11	-	-
February	5	5	-	-
March	17	17	-	-
April	7	7	-	-
May	11	11	-	-
June	4	4	-	-
July	10	9	-	1
August	6	6	-	-
September	11	10	-	1
October	6	6	-	-
November	13	13	-	-
December	6	6	-	-
TOTAL	107	105	0	2

PUC SAMPLING PROGRAM

January	-	-	-	-
February	3	1	1	1
March	28	28	-	-
April	28	28	-	-
May	35	34	-	1
June	21	20	-	1
July	17	17	-	-
August	35	34	1	-
September	21	20	1	-
October	21	20	-	1
November	28	27	-	1
December	7	7	-	-
TOTAL	244	236	3	5

TABLE IX

*TREATED WATER QUALITY

TOWN OF BOWMANVILLE - MUNICIPAL WATER WORKS

BACTERIOLOGICAL RESULTS - 1972

HEALTH UNIT SAMPLING PROGRAM

MONTH	NO. SAMPLES	NO. SATISFACTORY	NO. DOUBTFUL	NO. UNSATISFACTORY
January	11	11	-	-
February	9	9	-	-
March	19	19	-	-
April	18	15	-	3
May	8	8	-	-
June	17	13	-	4
July	26	24	-	2
August	19	14	-	5
September				
October				

** PUC SAMPLING PROGRAM

January	27	19	4	4
February	28	21	2	5
March	28	20	2	6
April	28	17	1	10
May	39	34	2	3
June	21	14	2	5
July	32	29	-	3
August	45	29	6	9
September	21	14	2	6
October				

* Delivered Water Quality

** Includes samples collected by staff of Ministry of the Environment.

TABLE X

TREATED WATER QUALITY

TOWN OF BOWMANVILLE

MUNICIPAL WATER WORKS

BACTERIOLOGICAL RESULTS AT EQUALIZER

MONTH	NUMBER OF SAMPLES	NUMBER SATISFACTORY
1971		
January	-	-
February	-	-
March	4	4
April	3	3
May	5	5
June	3	3
July	3	3
August	5	4
September	3	3
October	3	3
November	4	3
December	1	1
TOTAL	34	32
1972		
January	4	1
February	4	0
March	4	0
April	4	0
May	5	5
June	3	1
July	5	3
August	6	3
September	3	3
TOTAL	38	16

APPENDIX B

WASTE DISPOSAL

SEWAGE TREATMENT

SUMMARIES

Tables XI - XVII

Flows Reported
In Million Gallons Per Day

TABLE XI

TOWN OF BOWMANVILLE

SEWAGE TREATMENT FACILITIES - FLOW DATA

Month	1969		1970		1971		1972	
	Average	Maximum	Average	Maximum	Average	Maximum	Average	Maximum
JAN.	0.599	1.599	0.610	1.242	0.610	0.742	1.036	1.416
FEB.	0.697	1.873	0.592	1.200	0.919	2.177	0.765	1.100
MAR.	0.591	0.863	0.913	1.280	1.395	2.098	1.229	1.393
APR.	0.980	1.399	1.042	1.447	1.119	2.388	1.933	2.592
MAY	1.019	1.279	0.863	1.164	0.743	0.898	1.060	1.595
JUNE	0.830	1.037	0.623	0.813	0.780	2.000	-	-
JULY	0.827	1.621	0.705	0.799	0.761	1.312	-	-
AUG.	0.943	1.709	0.607	0.714	0.731	1.407	-	-
SEPT.	0.669	0.785	0.574	0.657	0.773	1.241	-	-
OCT.	0.623	0.787	0.654	1.382	0.760	0.957	-	-
NOV.	0.882	1.589	0.743	1.129	0.746	0.917	-	-
DEC.	0.896	1.964	0.765	1.508	1.303	2.030	-	-
YEARLY SUMMARY	0.795	1.964	0.724	1.508	0.886	2.388		

All results reported in ppm.

PUC Sampling Programme

TABLE XII

SEWAGE TREATMENT

TOWN OF BOWMANVILLE

SUMMARY OF ANALYSES - 1971-1972

1971	BOD_5			SUSPENDED SOLIDS		
DATE (d/m)	Raw Sewage	Final Effluent	% Reduction	Raw Sewage	Final Effluent	% Reduction
6/1	110	16	85	160	25	84
3/2	220	48	78	190	40	79
9/3	110	28	74	110	30	73
12/4	90	20	78	120	20	83
1/6	170	15	91	100	15	85
13/7	280	18	94	300	10	97
31/8	130	22	83	270	15	94
8/11	240	30	87	570	5	99
7/12	80	26	67	110	15	86
Average	159	25	82	214	19	87
Maximum	280	48	94	570	40	99
Minimum	80	15	67	100	5	73
1972						
14/2	46	12	74	100	5	95
21/3	50	12	76	80	10	88
18/4	50	22	56	90	40	56
/5	110	34	69	130	45	65
17/5	110	70	36	110	40	64
13/6	110	100	91	90	60	33
17/7	90	38	58	50	30	40
11/9	75	34	55	75	35	53
Average	80	40	64	91	33	62
Maximum	110	100	91	130	60	95
Minimum	46	12	36	50	5	33

TABLE XIII

TOWN OF BOWMANVILLE - MUNICIPAL SEWAGE WORKS

ACTIVATED SLUDGE PLANT

	5 DAY BOD			SUSPENDED SOLIDS		
Date (d/m)	Raw Sewage	Final Effluent	% Reduction	Raw Sewage	Final Effluent	% Reduction
1970						
16/2	220	70	68	220	75	66
14/3	110	8	93	165	15	91
26/6	130	9.5	93	160	15	91
8/7	160	4.5	97	190	15	92
6/8	170	7.5	96	170	5	97
2/9	220	17.0	92	160	5	97
6/10	75	9.0	88	150	15	90
17/11	150	9.0	94	240	5	98
Average	154	17	90	182	20	90
Maximum	220	70	97	240	75	98
1971						
6/1	110	15	86	160	20	88
3/2	220	28	87	190	40	79
9/3	110	16	85	110	25	77
12/4	90	19	79	120	30	75
1/6	170	28	83	100	5	95
13/7	280	24	91	300	15	95
31/8	130	17	87	270	30	88
8/11	240	30	87	570	5	99
7/12	80	26	68	110	15	86
Average	159	22	84	124	20	87
Maximum	280	30	91	570	40	99
Minimum	80	15	68	100	5	75
1972						
14/2	46	12	74	100	5	95
21/3	50	12	76	80	10	88
18/4	50	22	56	90	40	56
0/5	110	34	69	130	45	65
17/5	110	70	36	110	40	64
13/6	110	100	9	90	60	33
17/7	90	38	58	50	30	40
29/8	300	26	91	100	30	70
11/9	75	26	65	75	45	40
Average	104	38	[illegible]	92	34	61
Maximum	300	100	91	130	60	95
Minimum	46	12	9	50	5	33

All results reported in ppm.

TABLE XIV

SEWAGE TREATMENT

TOWN OF BOWMANVILLE

MUNICIPAL SEWAGE WORKS

Trickling Filter Plant

DATE	5-DAY BOD			SUSPENDED SOLIDS		
	Raw Sewage	Final Effluent	% Reduction	Raw Sewage	Final Effluent	% Reduction
1970						
16/2	220	50	77	220	50	77
14/3	110	25	77	165	25	85
26/6	130	46	65	160	65	59
8/7	160	75	53	190	80	58
6/8	170	40	76	170	40	76
2/9	220	75	66	160	70	69
6/10	75	22	71	155	15	90
17/11	150	24	84	240	20	92
Average	154	45	71	182	46	76
Maximum	220	75	84	240	80	92
Minimum	75	22	53	155	15	58
1971						
6/1	110	28	75	160	20	88
3/2	220	60	73	190	35	82
9/3	110	32	71	110	30	73
12/4	90	22	76	120	25	79
1/6	170	20	88	100	20	80
13/7	280	14	95	300	15	95
31/8	130	17	87	270	5	98
Average	158	28	81	178	21	85
Maximum	280	60	95	300	30	98
Minimum	90	14	71	100	5	73
1972 *						
29/8	300	24	92	100	10	90
11/9	75	19	75	75	10	87
Average	280	20	84	85	10	88

* Bio-filter down for repairs for first seven months.

All results reported in ppm.

TABLE XV

Efficiency: Trickling Filter Plant and Activated Sludge Plant

48-HOUR STUDY

TOWN OF BOWMANVILLE SEWAGE TREATMENT FACILITIES

SUMMARY OF CHEMICAL ANALYSES

MAY 4 THROUGH MAY 6, 1971

Trickling Filter Plant

TIME	BOD_5			SUSPENDED SOLIDS		
	Raw Sewage	Effluent	% Reduction	Raw Sewage	Effluent	% Reduction
12:00 PM - 8:00 PM	110	38	65	120	35	71
8:00 PM - 4:00 AM	80	55	31	80	30	63
4:00 AM - 12:00 PM	70	38	46	60	30	50
12:00 PM - 8:00 PM	100	20	80	90	20	78
8:00 PM - 4:00 AM	65	36	45	45	15	67
4:00 AM - 12:00 PM	80	36	55	80	25	69
Average		37	54		26	66
Maximum		55	80		35	78
Minimum		20	31		15	50

Activated Sludge Plant

12:00 PM - 8:00 PM	110	28	75	120	45	63
8:00 PM - 4:00 AM	80	24	70	80	35	56
4:00 AM - 12:00 PM	70	17	76	60	25	58
12:00 PM - 8:00 PM	100	18	82	90	30	67
8:00 PM - 4:00 AM	65	8.5	86	45	10	78
4:00 AM - 12:00 PM	80	20	75	80	30	63
Average		19	77		29	64
Maximum		28	86		45	78
Minimum		8.5	70		10	56

TABLE XVI

BOD_5 LOADING ON SOPER CREEK

TOWN OF BOWMANVILLE

SEWAGE TREATMENT FACILITIES

Activated Sludge Process (new plant)

Design Flow	-	1.0 MGD
BOD_5 Loading Strength	-	200 ppm
Expected removal efficiency	-	90 - 95 per cent

Therefore, expected stream loading

at 95 per cent = 100 lbs.

at 90 per cent = 200 lbs.

Bio-filtration Process (old plant)

Design Flow	-	0.5 MGD
BOD_5 Loading Strength	-	200 ppm
Expected removal efficiency	-	85 - 90 per cent

Therefore, expected stream loading

at 90 per cent = 100 lbs.

at 85 per cent = 150 lbs.

Therefore, expected stream loading under ideal operating conditions would vary between 200 lbs. BOD_5 and 250 lbs. BOD_5 at the present design flow.

All Results reported in ppm.

TABLE XVII

TOWNSHIP OF DARLINGTON

PINE RIDGE SCHOOL

SEWAGE TREATMENT FACILITIES

SUMMARY OF SEWAGE ANALYSES
1970-1972

	BOD_5			SUSPENDED SOLIDS		
	Raw	Final Effluent	% Reduction	Raw	Final Effluent	% Reduction
1970						
Max.	300	65	95	185	145	94
Min.	42	8	38	50	5	0
Avg.	180	29	84	109	35	68
1971						
Max.	420	44	99	290	180	97
Min.	46	2.5	63	35	5	0
Avg.	180	20	84	111	27	77
1972						
Max.	320	120	96	140	50	93
Min.	55	5.5	8	40	10	20
Avg.	160	40	68	90	24	69

APPENDIX C

WATER POLLUTION SURVEY

SAMPLE RESULTS - 1972

Tables XVIII - XX

SAMPLE RESULTS - 1971

Tables XXI - XXIII

All analyses reported in ppm except where indicated.

SOPER CREEK
Samples collected by:
J.A. Clarke
A.D. McConnell

TOWN OF BOWMANVILLE

WATER POLLUTION SURVEY

TABLE XVIII(a)

CHEMICAL REPORT - August 30, 1972

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	5-DAY BOD	TURBIDITY UNITS	CHLORIDE as Cl	TOTAL KJELDAHL as N	TOTAL PHOSPHORUS as P
S-1	0.65	Soper Creek at West Beach Road	7.5	10	14	1.3	0.39
S-2	1.0	Soper Creek at Simpson Avenue	15	12	23	2.2	0.9
S-3	1.15	Outfall from Bowmanville STP	130	100	89	18.0	0.65
S-4	1.3	Soper Creek at Baseline Road	1.4	8	9	0.29	0.042
S-5	1.3	Storm sewer outfall on south side of Baseline Road just west of Soper Creek	0.6	3	190	0.24	0.041
S-6	1.3	Storm sewer outfall on east side of Soper Creek at Baseline Road			N O	F L O W	
S-7	1.4	Storm sewer outfall west of Soper Creek just south of Bowmanville Drop-in-Centre	0.6	3	206	0.19	0.024
S-8	2.25	Storm sewer outfall south side Highway #2, east of Simpson Avenue North	8.0	10	12	1.5	0.15

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	5-DAY BOD	TURBDITY UNITS	CHLORIDE as Cl	TOTAL KJELDAHL as N	TOTAL PHOSPHORUS as P
S-9	1.9	Soper Creek at Hwy. #2	1.6	15	8	0.56	0.033
S-10	1.95	Tributary of Soper Creek, east of Bowmanville Zoo	2.0	50	15	0.63	0.094
S-11	2.0	Tributary of Soper Creek, draining the Bowmanville Zoo property			N O F L O W		
S-12	2.05	Tributary of Soper Creek, west of Bowmanville Zoo at Mearns Street	6.0	G 150	56	3.5	1.4
S-13	2.7	Storm sewer outfall near St. George Street	0.6	4	27	0.19	0.022
S-14	2.8	Storm sewer outfall east of Liberty Street near Carlisle Avenue	0.6	2	158	0.45	0.031
S-15	2.81	Storm sewer outfall on north side of Concession Street, east of Liberty Street	3.0	50	212	1.5	0.48
S-16	3.0	Soper Creek at Concession Street	0.6	8	7	0.29	0.056
S-17	3.1	Storm sewer outfall from Pine Ridge School for Boys to east side of Soper Creek	0.8	35	35	0.73	0.14
S-18	3.3	Outfall from Pine Ridge School for Boys sewage treatment plant to east side of Soper Creek	0.4	10	81	5.4	1.9
S-19	3.4	Soper Creek above outfalls from Pine Ridge School for Boys	1.0	8	7	0.31	0.037

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	5-DAY BOD	TURBIDITY UNITS	CHLORIDE as CL	TOTAL KJELDAHL as N	TOTAL PHOSPHORUS as P
S-20	4.0	Storm sewer oufall on east side of Liberty Street opposite Sunset Road			N O	F L O W	
S-21	4.0	Storm sewer outfall on east side of Liberty Street opposite Sunicrest Boulevard			N O	F L O W	
S-22	3.8	Tributary of Soper Creek at Mearns Street North			N O	F L O W	
S-23	4.21	Tributary of Soper Creek above confluence, north side of Town Boundary Road	1.2	10	22	0.53	0.024
S-24	4.22	Soper Creek upstream of Town of Bowmanville	0.4	4	6	0.23	0.026

G = greater than

All results expressed as per 100 ml of sample.

SOPER CREEK
Samples collected by:
J.A. Clarke
A.D. McConnell

TOWN OF BOWMANVILLE

WATER POLLUTION SURVEY

TABLE XVIII(b)

BACTERIOLOGICAL REPORT - August 30, 1972

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	ENTEROCOCUS BACTERIA	FECAL COLIFORM	TOTAL COLIFORM
S-1	0.65	Soper Creek at West Beach Road	6,200	30,000	970,000
S-2	1.0	Soper Creek at Simpson Avenue	43,000	220,000	4,400,000
S-3	1.15	Outfall from Bowmanville STP	190,000	700,000	11,300,000
S-4	1.3	Soper Creek at Baseline Road	420	670	1,700
S-5	1.3	Storm sewer outfall on south side of Baseline Road just west of Soper Creek	8,100	2,800	3,500
S-6	1.3	Storm sewer outfall on east side of Soper Creek at Baseline Road	N O F L O W		
S-7	1.4	Storm sewer outfall west of Soper Creek just south of Bowmanville Drop-in-Centre	860	100	1,000
S-8	2.25	Storm sewer outfall south side Highway #2, east of Simpson Avenue North	800	700	4,600

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	ENTEROCOCUS BACTERIA	FECAL COLIFORM	TOTAL COLIFORM
S-9	1.9	Soper Creek at Hwy. #2	690	1,100	2,300
S-10	1.95	Tributary of Soper Creek, east of Bowmanville Zoo	620	530	1,000
S-11	2.0	Tributary of Soper Creek, draining the Bowmanville Zoo property	N O	F L O W	
S-12	2.05	Tributary of Soper Creek, west of Bowmanville Zoo at Mearns Street	1,500	2,500	5,700
S-13	2.7	Storm sewer outfall near St. George Street	300	20	2,700
S-14	2.8	Storm sewer outfall east of Liberty Street near Carlisle Avenue	1,060	80	3,200
S-15	2.81	Storm sewer outfall on north side of Concession Street, east of Liberty Street	1,140	110	4,400
S-16	3.0	Soper Creek at Concession Street	180	L 10	3,500
S-17	3.1	Storm sewer outfall from Pine Ridge School for Boys to east side of Soper Creek	180	130	2,000
S-18	3.3	Outfall from Pine Ridge School for Boys sewage treatment plant to east side of Soper Creek	L 10	L 10	L 10
S-19	3.4	Soper Creek above outfalls from Pine Ridge School for Boys	170	90	1,700
S-20	4.0	Storm sewer outfall on east side of Liberty Street opposite Sunset Road	N O	F L O W	

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	ENTEROCOCUS BACTERIA	FECAL COLIFORM	TOTAL COLIFORM
S-21	4.0	Storm sewer outfall on east side of Liberty Street opposite Sunicrest Boulevard	N O F L O W		
S-22	3.8	Tributary of Soper Creek at Mearns Street North	N O F L O W		
S-23	4.21	Tributary of Soper Creek above confluence, north side of Town Boundary Road	660	250	2,800
S-24	4.22	Soper Creek upstream of Town of Bowmanville	220	80	570

L = less than

All results reported in ppm except where indicated.

BOWMANVILLE CREEK
Samples collected by:
J.A. Clarke
A.D. McConnell

TOWN OF BOWMANVILLE

WATER POLLUTION SURVEY

TABLE XIX(a)

CHEMICAL REPORT - August 31, 1972

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	5-DAY BOD	TURBIDITY UNITS	CHLORIDE as Cl	TOTAL KJELDAHL as N	TOTAL PHOSPHORUS as P
B-1	0.0	Mouth of Bowmanville Creek	6.0	12	16	0.78	0.26
B-2	0.73	Bowmanville Creek at West Beach Road	1.0	60	9	0.35	0.075
B-3	1.3	Bowmanville Creek at Baseline Road	0.8	70	7	0.30	0.060
B-4	1.7	Storm sewer outfall east side of Bowmanville Creek opposite Nelson Street	0.4	6	207	0.38	0.015
B-5	2.0	Storm sewer outfall east side of Bowmanville Creek at Albert Street	0.4	3	31	0.25	0.014
B-6	2.2	Drainage ditch, east side of Waverly Road south of Lawrence			N O	F L O W	
B-7	2.1	Bowmanville Creek below Goodyear Rubber Company Limited	0.8	-	7	0.32	0.034
B-8	2.21	Outfall from Goodyear Rubber Company Limited	0.4	20	16	0.25	0.023

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	5-DAY BOD	TURBIDITY UNITS	CHLORIDE as Cl	TOTAL KJELDAHL as N	TOTAL PHOSPHORUS as P
B-9	2.21	Outfall from Goodyear Rubber Company Limited	1.8	15	23	0.30	0.029
B-10	2.22	Outfall from Goodyear Rubber Company Limited	1.4	8	33	0.27	0.55
B-11	2.23	Outfall from Goodyear Rubber Company Limited	1.2	70	9	0.34	0.046
B-12	2.23	Outfall from Goodyear Rubber Company Limited	1.0	70	7	0.36	0.046
B-13	2.25	Outfall from Goodyear Rubber Company Limited	0.6	60	17	0.35	0.040
B-14	2.3	Bowmanville Creek, 100 yards downstream of Hwy. #2 bridge	1.0	40	6	0.33	0.037
B-15	2.32	Storm sewer outfall, east of Bowmanville Creek, south side Hwy. #2, west of Queen Street	4.5	35	650	1.6	6.0
B-16	2.4	Storm sewer outfall, near south-east corner of mill pond			N O	F L O W	
B-17	2.9	Tributary of Bowmanville Creek, north of Hwy. #2, east of County Road #7			N O	F L O W	
B-18	2.78	Outfall from R.M. Hollingshead Co., near south-west corner of Foundry	0.4	2	18	0.15	0.002

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	5-DAY BOD	TURBIDITY UNITS	CHLORIDE as Cl	TOTAL KJELDAHL as N	TOTAL PHOSPHORUS as P
B-19	2.8	Outfall from R.M. Hollingshead Co., 200' north of sampling point #B-18	1.6	3	19	0.26	0.038
B-20	3.0	Bowmanville Creek above mill pond	0.8	50	6	0.28	0.036
B-21	3.0	Jackman's Creek near confluence with Bowmanville Creek	1.2	50	44	0.95	0.33
B-22	3.05	Road culvert at end of Rehder Avenue, east of Bowmanville Creek			N O	F L O W	
B-23	3.1	Road culvert at end of Frederick Avenue, east of Bowmanville Creek			N O	F L O W	
B-24	3.2	Jackman's Creek at Jackman's Road			N O	F L O W	
B-25	3.3	Storm sewer outfall, north-west of Fourth Street on west side of Scugog Street			N O	F L O W	
B-26	3.5	Jackman's Creek at Scugog Street			N O	F L O W	
B-27	3.45	Bowmanville Creek at Jackman's Road	1.8	70	8	0.41	0.080
B-28	3.8	Bowmanville Creek upstream of municipal sanitary landfill site	1.0	35	6	0.31	0.022

All results expressed as per 100 ml of sample.

BOWMANVILLE CREEK
Samples collected by:
J.A. Clarke
A.D. McConnell

TOWN OF BOWMANVILLE

WATER POLLUTION SURVEY

TABLE XIX(b)

BACTERIOLOGICAL REPORT - August 31, 1972

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	ENTEROCOCUS BACTERIA	FECAL COLIFORM	TOTAL COLIFORM
B-1	0.0	Mouth of Bowmanville Creek	60	60	2,000
B-2	0.73	Bowmanville Creek at West Beach Road	S A M P L E B R O K E N I N T R A N S I T		
B-3	1.3	Bowmanville Creek at Baseline Road	380	130	810
B-4	1.7	Storm sewer outfall east side of Bowmanville Creek opposite Nelson Street	290	360	3,100
B-5	2.0	Storm sewer outfall east of Bowmanville Creek at Albert Street	20	L 10	530
B-6	2.2	Drainage ditch, east side of Waverly Road south of Lawrence	N O F L O W		
B-7	2.1	Bowmanville Creek below Goodyear Rubber Company Limited	200	100	3,700
B-8	2.21	Outfall from Goodyear Rubber Company Limited	L 10	L 10	L 10

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	ENTEROCOCUS BACTERIA	FECAL COLIFORM	TOTAL COLIFORM
B-9	2.21	Outfall from Goodyear Rubber Company Limited	L 100	100	900
B-10	2.22	Outfall from Goodyear Rubber Company Limited	20	L 10	100
B-11	2.23	Outfall from Goodyear Rubber Company Limited	500	400	4,600
B-12	2.23	Outfall from Goodyear Rubber Company Limited	400	300	4,600
B-13	2.25	Outfall from Goodyear Rubber Company Limited	9,000	150	41,000
B-14	2.3	Bowmanville Creek, 100 yards downstream of Hwy. #2 bridge	70	160	1,040
B-15	2.32	Storm sewer outfall, east of Bowmanville Creek, south side Hwy. #2, west of Queen Street	1,300	L 100	10,900
B-16	2.4	Storm sewer outfall, near south-east corner of mill pond	N O F L O W		
B-17	2.9	Tributary of Bowmanville Creek, north of Hwy. #2, east of County Road #7	N O F L O W		
B-18	2.78	Outfall from R.M. Hollingshead Co., near south-west corner of Foundry	350	20	2,300

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	ENTEROCOCUS BACTERIA	FECAL COLIFORM	TOTAL COLIFORM
B-19	2.8	Outfall from R.M. Hollingshead Co., 200' north of sampling point #B-18	10	L 10	2,700
B-20	3.0	Bowmanville Creek above mill pond	300	80	270
B-21	3.0	Jackman's Creek near confluence with Bowmanville Creek	1,700	500	12,800
B-22	3.05	Road culvert at end of Rehder Avenue, east of Bowmanville Creek	N O F L O W		
B-23	3.1	Road culvert at east end of Frederick Avenue, east of Bowmanville Creek	N O F L O W		
B-24	3.2	Jackman's Creek at Jackman's Road	N O F L O W		
B-25	3.3	Storm sewer outfall, north-west of Fourth Street on west side of Scugog Street	N O F L O W		
B-26	3.5	Jackman's Creek at Scugog Street	N O F L O W		
B-27	3.45	Bowmanville Creek at Jackman's Road	150	60	520
B-28	3.8	Bowmanville Creek upstream of municipal sanitary landfill site	70	70	2,600

L = less than

All results reported in ppm except where indicated.

LAKE ONTARIO
Samples collected by:
J.A. Clarke
A.D. McConnell

TOWN OF BOWMANVILLE

WATER POLLUTION SURVEY

TABLE XX(a)

CHEMICAL REPORT - August 30, 1972

SAMPLING POINT NUMBER	LOCATION	5-DAY BOD	TURBIDITY UNITS	CHLORIDE as Cl	TOTAL KJELDAHL as N	TOTAL PHOSPHORUS as P
0-1	Lake Ontario, 100' east of Bowmanville Creek	1.4	8	29	0.36	0.060
0-2	Lake Ontario, 100' west of Bowmanville Creek	2.0	6	31	0.26	0.025
0-3	Lake Ontario, 1,000' east of Bowmanville Creek	0.6	4	30	0.37	0.042
0-4	Lake Ontario, 1,000' west of Bowmanville Creek	3.5	10	30	0.54	0.11

All results expressed as per 100 ml of sample.

LAKE ONTARIO
Samples collected by:
J.A. Clarke
A.D. McConnell

TOWN OF BOWMANVILLE

WATER POLLUTION SURVEY

TABLE XX(b)

BACTERIOLOGICAL REPORT - August 30, 1972

SAMPLING POINT NUMBER	LOCATION	ENTEROCOCUS BACTERIA	FECAL COLIFORM	COLIFORM BACTERIA
0-1	Lake Ontario, 100' east of Bowmanville Creek	10	10	2,300
0-2	Lake Ontario, 100' west of Bowmanville Creek	L 10	L 10	80
0-3	Lake Ontario, 1000' east of Bowmanville Creek	L 10	10	1,400
0-4	Lake Ontario, 1000' west of Bowmanville Creek	60	L 10	1,000

L = less than

ALL ANALYSES REPORTED IN PPM

SOPER CREEK

SAMPLES COLLECTED BY: J. A. CLARKE
A. D. McCONNELL
H. C. McNAUGHTON

TOWN OF BOWMANVILLE

WATER POLLUTION SURVEY

TABLE XXI(A) CHEMICAL ANALYSES

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	TURBIDITY UNITS	CHLORIDE Cl	TOTAL KJELD AS N	TOTAL PHOSPHORUS AS P
S-1	0.65	SOPER CREEK AT WEST BEACH ROAD	10/5/71	2.0	5	4	15	1.5	0.38
			14/6/71	3.5	10	12	15	1.8	0.45
			12/8/71	3.0	20	12	12	0.98	0.42
S-2	1.0	SOPER CREEK AT SIMPSON AVENUE	10/5/71	4.0	10	6	23	3.7	0.88
			12/8/71	6.0	20	10	24	1.9	1.5
S-3	1.15	OUTFALL FROM BOWMANVILLE SEWAGE TREATMENT PLANT	10/5/71	30.	40	15	105	25.	6.0
			14/6/71	17.	10	8	107	21.	4.9
			12/8/71	19.	10	10	76	4.8	5.5
S-4	1.3	SOPER CREEK AT BASELINE ROAD	10/5/71	1.2	5	1.5	9	0.52	0.026
			14/6/71	2.5	10	8	9	0.72	0.12
			12/8/71	1.2	10	8	6	0.44	0.14
S-5	1.3	STORM SEWER OUTFALL ON SOUTH SIDE OF BASELINE ROAD JUST WEST OF SOPER CREEK	10/5/71	200.	330	10	218	1.8	0.23
			14/6/71	SMALL FLOW - NOT SAMPLED					
			12/8/71	1.8	5	6	107	0.70	0.13
S-6	1.3	STORM SEWER OUTFALL ON EAST SIDE OF SOPER CREEK AT BASELINE ROAD	10/5/71	19.0	15	6	57	13.	2.3
			14/6/71	NO FLOW					
			12/8/71	NO FLOW					
S-7	1.4	STORM SEWER OUTFALL WEST OF SOPER CREEK JUST SOUTH OF BOWMANVILLE DROP-IN CENTRE	10/5/71	0.6	5	1.5	138	0.17	0.022
			14/6/71	SMALL FLOW - NOT SAMPLED					
			12/8/71	1.0	10	6	192	0.41	0.026

TABLE XXI(A) CHEMICAL ANALYSES (CONT'D)

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	TURBIDITY UNITS	CHLORIDE AS Cl	TOTAL KJELD AS N	TOTAL PHOSPHORUS AS P
S-8	2.25	STORM SEWER OUTFALL SOUTH SIDE HWY # 2 EAST OF SIMPSON AVENUE NORTH	10/5/71	20.	80	60	31	1.7	0.38
			14/6/71	2.0	35	-	24	-	-
			12/8/71	7.0	75	35	9	0.85	0.24
S-9	1.9	SOPER CREEK AT HWY # 2	10/5/71	1.0	5	4	10	0.54	0.034
			14/6/71	2.5	10	8	5	-	-
			12/8/71	1.2	10	12	6	0.38	0.048
S-10	1.95	TRIBUTARY OF SOPER CREEK EAST OF BOWMANVILLE ZOO	10/5/71	1.6	5	8	13	0.64	0.048
			12/8/71	0.8	10	10	13	0.48	0.048
S-11	2.0	TRIBUTARY OF SOPER CREEK DRAINING THE BOWMANVILLE ZOO PROPERTY	10/5/71	7.5	80	30	5	2.6	0.55
			14/6/71				N O F L O W		
			12/8/71				N O F L O W		
S-12	2.05	TRIBUTARY OF SOPER CREEK WEST OF BOWMANVILLE ZOO AT MEARNS STREET	10/5/71	0.8	5	3	6	0.48	0.026
			14/6/71				N O F L O W		
			12/8/71				N O F L O W		
S-13	2.7	STORM SEWER OUTFALL NEAR ST. GEORGE STREET	12/8/71	0.6	5	3	18	0.16	0.028
S-14	2.8	STORM SEWER OUTFALL EAST OF LIBERTY STREET NEAR CARLISLE AVENUE	12/8/71	0.8	5	4	10	0.12	0.024
S-15	2.81	STORM SEWER OUTFALL ON NORTH SIDE OF CONCESSION ST. E. OF LIBERTY ST.	12/8/71	0.8	20	4	150	0.15	0.052
S-16	3.0	SOPER CREEK AT CONCESSION STREET	10/5/71	0.6	5	3	62	0.42	0.71
			12/8/71	0.6	5	6	5	0.23	0.028

TABLE XXI(A) CHEMICAL ANALYSES (CONT'D)

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	TURBIDITY UNITS	CHLORIDE AS Cl	TOTAL KJELD AS N	TOTAL PHOSPHORUS AS P
S-17	3.1	STORM SEWER OUTFALL FROM PINE RIDGE SCHOOL FOR BOYS TO EAST SIDE OF SOPER CREEK	10/5/71	11.	10	8	57	12.	1.9
			14/6/71				NO FLOW		
			12/8/71				NO FLOW		
S-18	3.3	OUTFALL FROM PINE RIDGE SCHOOL FOR BOYS SEWAGE TREATMENT PLANT TO EAST SIDE OF SOPER CREEK	10/5/71	0.2	5	2	9	1.2	0.032
			14/6/71	22.	15	25	32	21.	3.3
			12/8/71	1.4	5	10	70	3.8	3.1
S-19	3.4	SOPER CREEK ABOVE OUTFALLS FROM PINE RIDGE SCHOOL FOR BOYS	10/5/71	0.6	5	3	25	0.35	0.028
			12/8/71	1.0	10	10	5	0.3	0.10
S-20	4.0	STORM SEWER OUTFALL ON EAST SIDE OF LIBERTY STREET OPPOSITE SUNSET ROAD	10/5/71				NO FLOW		
			14/6/71				NO FLOW		
			12/8/71				NO FLOW		
S-21	4.0	STORM SEWER OUTFALL ON EASE SIDE OF LIBERTY STREET OPPOSITE SUNICREST BLVD.	10/5/71				SMALL FLOW - NOT SAMPLED		
			14/6/71				NO FLOW		
			12/8/71				NO FLOW		
S-22	3.8	TRIBUTARY OF SOPER CREEK AT MEARNS STREET NORTH	10/5/71	0.6	5	3	25	0.42	0.022
			14/6/71				NO FLOW		
			12/8/71				NO FLOW		
S-23	4.21	TRIBUTARY OF SOPER CREEK ABOVE CONFLUENCE NORTH SIDE OF TOWN BOUNDARY RD.	10/5/71	0.4	5	3	16	0.40	0.011
			12/8/71	1.4	10	8	14	0.40	0.022
S-24	4.22	SOPER CREEK UPSTREAM OF TOWN OF BOWMANVILLE	10/5/71	0.6	5	2	7	0.31	0.014
			14/6/71	2.0	15	6	5	-	-
			12/8/71	0.8	5	6	4	0.19	0.012

ALL RESULTS EXPRESSED AS PER
100 MLS. OF SAMPLE

SOPER CREEK

SAMPLED COLLECTED BY:
J.A.CLARKE
A.D.McCONNELL
H.C.McNAUGHTON

TOWN OF BOWMANVILLE

WATER POLLUTION SURVEY

TABLE XXI(B) BACTERIOLOGICAL REPORT

SAMPLING POINT NO.	STREAM MILEAGE	LOCATION	DATE	STREPTOCOCCUS	FECAL COLIFORMS	TOTAL COLIFORMS
S-1	0.65	SOPER CREEK AT WEST BEACH ROAD	10/5/71	<10	<10	<10
			14/6/71	1	1	120
			12/8/71	4,300	32,000	780,000
S-2	1.0	SOPER CREEK AT SIMPSON AVENUE	10/5/71	<10	<10	<10
			14/6/71	1	1	16
			12/8/71	7,900	79,000	1,630,000
S-3	1.15	OUTFALL FROM BOWMANVILLE SEWAGE TREATMENT PLANT	10/5/71	1	1	4
			14/6/71	10	<10	<10
			12/8/71	19,300	82,000	1,800,000
S-4	1.3	SOPER CREEK AT BASELINE ROAD	10/5/71	260	160	480
			14/6/71	608	3,500	5,800
			12/8/71	1,400	1,390	4,900
S-5	1.3	STORM SEWER OUTFALL ON SOUTH SIDE OF BASELINE ROAD JUST WEST OF SOPER CREEK	10/5/71	230	2,600	4,800
			14/6/71	76	4,800	11,400
			12/8/71	5,300	14,100	37,000
S-6	1.3	STORM SEWER OUTFALL ON EAST SIDE OF SOPER CREEK AT BASE-LINE ROAD	10/5/71	36,000	230,000	300,000
			14/6/71		NO FLOW	
			12/8/71		NO FLOW	
S-7	1.4	STORM SEWER OUTFALL WEST OF SOPER CREEK JUST SOUTH OF BOWMANVILLE DROP-IN-CENTRE	10/5/71	<10	10	30
			14/6/71	12	1	8
			12/8/71	1,090	110	1,850

TABLE XXI(B) CONT'D.

SAMPLING POINT NO.	STREAM MILEAGE	LOCATION	DATE	STREPTOCOCCUS	FECAL COLIFORMS	TOTAL COLIFORMS
S-8	2.25	STORM SEWER OUTFALL SOUTH SIDE HWY2 EAST OF SIMPSON AVE. N.	10/5/71	200	1,200	3,000
			14/6/71	164	208	3,800
			12/8/71	10,300	900	175,000
S-9	1.9	SOPER CREEK AT HWY 2	10/5/71	60	90	200
			14/6/71	648	3,800	4,200
			12/8/71	G 1,500	4,106	9,000
S-10	1.95	TRIBUTARY OF SOPER CREEK EAST OF BOWMANVILLE ZOO	10/5/71	40	50	320
			12/8/71	620	780	4,900
S-11	2.0	TRIBUTARY OF SOPER CREEK DRAINING THE BOWMANVILLE ZOO PROPERTY	10/5/71	<10	<10	10
			14/6/71	316	188	508
			12/8/71		NO FLOW	
S-12	2.05	TRIBUTARY OF SOPER CREEK WEST OF BOWMANVILLE ZOO AT MEARNS STREET	10/5/71	10	10	10
			14/6/71	688	6,100	8,300
			12/8/71		NO FLOW	
S-13	2.7	STORM OUTFALL NEAR ST. GEORGE STREET	12/8/71	1,040	230	8,600
S-14	2.8	STORM SEWER OUTFALL EAST OF LIBERTY STREET NEAR CARLISILE AVE	12/8/71	3,400	150	6,700
S-15	2.81	STORM SEWER OUTFALL ON NORTH SIDE OF CONCESSION ST. EAST OF LIBERTY STREET	12/8/71	1,250	310	10,300
S-16	3.0	SOPER CREEK AT CONCESSION ST.	10/5/71	<10	<10	30
			12/8/71	330	240	1,020

TABLE XXI(B) CONT'D.

SAMPLING POINT NO.	STREAM MILEAGE	LOCATION	DATE	STREPTOCOCCUS	FECAL COLIFORMS	TOTAL COLIFORMS
S-17	3.1	STORM SEWER OUTFALL FROM PINE RIDGE SCHOOL FOR BOYS TO EAST SIDE OF SOPER CREEK	10/5/71 14/6/71 12/8/71	<10 144	<10 316 NO FLOW	<10 7,100
S-18	3.3	OUTFALL FROM PINE RIDGE SCHOOL FOR BOYS SEWAGE TREATMENT PLANT TO EAST SIDE OF SOPER CREEK	10/5/71 14/6/71 12/8/71	<10 1 <10	<10 1 <10	<10 1 <10
S-19	3.4	SOPER CREEK ABOVE OUTFALLS FROM PINE RIDGE SCHOOL FOR BOYS	12/8/71	270	440	910
S-20	4.0	STORM SEWER OUTFALL ON EAST SIDE OF LIBERTY STREET OPPOSITE SUNSET ROAD	10/5/71 14/6/71 12/8/71		NO FLOW NO FLOW NO FLOW	
S-21	4.0	STORM SEWER OUTFALL ON EAST SIDE OF LIBERTY STREET OPPOSITE SUNICREST BLVD.	10/5/71 14/6/71 12/8/71	40	<10 NO FLOW NO FLOW	280
S-22	3.8	TRIBUTARY OF SOPER CREEK AT MEARNS STREET NORTH	10/5/71 14/6/71 12/8/71	270	10 NO FLOW NO FLOW	90
S-23	4.21	TRIBUTARY OF SOPER CREEK ABOVE CONFLUENCE NORTH SIDE OF TOWN BOUNDARY ROAD	10/5/71 12/8/71	20 1,380	150 1,170	180 7,500
S-24	4.22	SOPER CREEK UPSTREAM OF TOWN OF BOWMANVILLE	10/5/71 14/6/71 12/8/71	30 272 340	<10 352 30	50 2,200 960

ALL ANALYSES REPORTED IN PPM

BOWMANVILLE CREEK

SAMPLES COLLECTED BY: J. A. CLARKE
A. D. McCONNELL
H. C. McNAUGHTON

TOWN OF BOWMANVILLE

WATER POLLUTION SURVEY

TABLE XXII(A) CHEMICAL ANALYSES

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	TURBIDITY UNITS	CHLORIDE Cl	TOTAL KJELD AS N	TOTAL PHOSPHORUS AS P
B-1	0.0	MOUTH OF BOWMANVILLE CREEK	11/5/71	1.6	10	12	16	0.29	0.27
			21/6/71	4.0	10	1.5	18	1.4	0.21
			13/8/71	3.5	20	--	10	0.75	0.30
B-2	0.73	BOWMANVILLE CREEK AT WEST BEACH ROAD	11/5/71	1.2	5	3	12	0.66	0.14
			21/6/71	2.5	10	4	4	0.54	0.36
			13/8/71	1.6	30	-	5	0.29	0.05
B-3	1.3	BOWMANVILLE CREEK AT BASE-LINE ROAD	11/5/71	1.8	5	3	12	0.31	0.026
			13/8/71	1.6	30	-	5	0.32	0.049
B-4	1.7	STORM SEWER OUTFALL EAST SIDE OF BOWMANVILLE CREEK OPPOSITE NELSON STREET	11/5/71	0.6	10	4	256	0.33	0.092
			13/8/71	3.0	10	8	351	0.65	0.039
B-5	2.0	STORM SEWER OUTFALL EAST OF BOWMANVILLE CREEK AT ALBERT STREET	11/5/71	4.0	60	30	52	1.2	0.21
			21/6/71	14.0	10	-	33	- -	--
			13/8/71	2.5	25	-	34	0.56	0.07
B-6	2.2	DRAINAGE DITCH EAST OF WAVERLY ROAD SOUTH OF LAWRENCE	11/5/71	0.8	5	1	26	0.74	0.022
			13/8/71			NO FLOW			
B-7	2.1	BOWMANVILLE CREEK BELOW GOOD-YEAR RUBBER COMPANY LIMITED	11/5/71	1.0	5	4	13	0.28	0.25
			13/8/71	3.0	-	70	5	1.4	0.80
B-8	2.21	OUTFALL FROM GOODYEAR RUBBER COMPANY LIMITED	11/5/71	1.0	5	3	33	0.37	0.048
			21/6/71	2.0	5	-	29	-	-
			13/8/71	0.6	5	6	26	0.21	0.024

TABLE XXII(A) CHEMICAL ANALYSES CONT'D.

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	TURBIDITY UNITS	CHLORIDE Cl	TOTAL KJELD AS N	TOTAL PHOSPHORUS AS P
B-9	2.21	OUTFALL FROM GOODYEAR RUBBER COMPANY LIMITED	11/5/71	3.0	20	25	23	0.42	-
			21/6/71	4.5	10	-	13	-	
			13/8/71	7.0	80	35	28	0.75	0.13
B-10	2.22	OUTFALL FROM GOODYEAR RUBBER COMPANY LIMITED	11/5/71	1.0	5	4	16	0.31	0.19
			21/6/71	2.5	5	-	12	-	-
			13/8/71	8.0	20	8	32	0.78	1.2
B-11	2.23	OUTFALL FROM GOODYEAR RUBBER COMPANY LIMITED	11/5/71	1.2	5	6	13	0.34	0.030
			21/6/71	2.0	10	-	18	-	-
			13/8/71	7.0	40	8	8	0.68	0.51
B-12	2.23	OUTFALL FROM GOODYEAR RUBBER COMPANY LIMITED	11/5/71	1.0	5	4	11	0.31	0.022
			21/6/71	2.0	20	-	10	-	-
			13/8/71	2.0	20	-	6	0.28	0.035
B-13	2.25	OUTFALL FROM GOODYEAR RUBBER COMPANY LIMITED	11/5/71	1.0	5	4	15	0.34	0.044
			21/6/71	2.0	5	-	16	-	-
			13/8/71				NO FLOW		
B-14	2.3	BOWMANVILLE CREEK BELOW HIGHWAY #2	11/5/71	1.0	5	4	7	0.32	0.026
			21/6/71	2.0	10	12	5	0.42	0.036
			13/8/71	1.6	45	12	4	0.32	0.053
B-15	2.32	STORM SEWER OUTFALL EAST OF BOWMANVILLE CREEK SOUTH SIDE OF HWY #2 WEST OF QUEEN STREET	11/5/71	32.0	60	4	804	1.4	1.8
			21/6/71	38.0	20	-	147	-	-
			13/8/71				NO FLOW		

TABLE XXII(A) CHEMICAL ANALYSES CONT'D.

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	TURBIDITY UNITS	CHLORIDE Cl	TOTAL KJELD AS N	TOTAL PHOSPHORUS AS P
B-16	2.4	STORM SEWER OUTFALL NEAR SOUTH-EAST CORNER OF MILL POND	11/5/71	2.0	10	4	8	0.58	0.10
			21/6/71	26.0	10	-	26	-	-
			13/8/71	5.5	30	6	104	1.9	0.22
B-17	2.9	TRIBUTARY OF BOWMANVILLE CREEK NORTH OF HWY #2 EAST OF COUNTY ROAD NO. 7	11/5/71	1.0	5	1	12	0.56	0.014
			13/8/71			NO FLOW			
B-18	2.78	OUTFALL FROM R.M. HOLLINGSHEAD COMPANY NEAR SOUTHWEST CORNER OF FOUNDRY	11/5/71	0.4	5	1.5	12	0.18	0.016
			21/6/71	1.0	5	-	23	-	-
			13/8/71	0.6	5	6	15	0.11	0.012
B-19	2.8	OUTFALL FROM HOLL. FOUNDRY 200 FEET NORTH OF SAMPLING PT. NO. B-18	13/8/71	2.0	5	6	12	0.18	0.066
B-20	3.0	BOWMANVILLE CREEK ABOVE MILL POND	11/5/71	0.8	5	4	17	0.21	0.052
			13/8/71	1.2	35	12	5	0.22	0.074
B-21	3.0	JACKMAN'S CREEK NEAR CONFLUENCE WITH BOWMANVILLE CREEK	13/8/71	3.0	160	50	35	1.3	0.55
B-22	3.05	ROAD CULVERT AT END OF REHDER AVE. EAST OF BOWMANVILLE CREEK	11/5/71	2.5	5	2	55	0.76	5.5
			13/8/71			NO FLOW			
B-23	3.1	ROAD CULVERT AT END OF FREDRICK AVE. EAST OF BOWMANVILLE CREEK	11/5/71	11.0	15	4	90	11.0	2.6
			13/8/71			NO FLOW			
B-24	3.2	JACKMAN'S CREEK AT JACKMAN'S RD.	11/5/71	1.0	5	1	45	0.41	0.012
			13/8/71			NO FLOW			

TABLE XXII(A) CHEMICAL ANALYSES CONT'D.

SAMPLING POINT NUMBER	STREAM MILEAGE	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	TURBIDITY UNITS	CHLORIDE Cl	TOTAL KJELD AS N	TOTAL PHOSPHOROUS AS P
B-25	3.3	STORM SEWER OUTFALL NORTHWEST OF FOURTH STREET ON WEST SIDE OF SCUGOG STREET	11/5/71	0.6	5	4	112	0.45	0.060
			13/8/71				NO FLOW		
B-26	3.5	JACKMANS CREEK AT SCUGOG ST.	11/5/71	1.6	30	10	24	0.96	0.088
			13/8/71				NO FLOW		
B-27	3.45	BOWMANVILLE CREEK AT JACKMANS ROAD	11/5/71	1.0	5	4	6	0.30	0.018
			13/8/71	1.2	20	12	6	0.22	0.022
B-28	3.8	BOWMANVILLE CREEK UPSTREAM OF BOWMANVILLE MUNICIPAL SANITARY LANDFILL SITE	11/5/71	1.0	5	3	6	0.34	0.018
			13/8/71	1.2	20	12	5	0.19	0.018

ALL RESULTS EXPRESSED AS
ICO MLS. OF SAMPLE

TOWN OF BOWMANVILLE

WATER POLLUTION SURVEY

BOWMANVILLE CREEK

SAMPLES COLLECTED BY:: J. A. CLARKE
A. D. McCONNELL
H. C. McNAUGHTON

TABLE XXII(B) BACTERIOLOGICAL REPORT

SAMPLING POINT NO.	STREAM MILEAGE	LOCATION	DATE	STREPTOCOCCUS	FECAL COLIFORMS	TOTAL COLIFOR
B-1	0.0	MOUTH OF BOWMANVILLE CREEK	11/5/71	<10	30	1,500
			21/6/71	140	50	4,800
			13/8/71	110	1910	73,000
B-2	0.73	BOWMANVILLE CREEK AT WEST BEACH ROAD	11/5/71	30	120	470
			21/6/71	660	1170	8,700
			13/8/71	200	120	3,600
B-3	1.3	BOWMANVILLE CREEK AT BASELINE ROAD	11/5/71	30	<10	170
			13/8/71	150	90	2,100
B-4	1.7	STORM SEWER OUTFALL EAST SIDE OF BOWMANVILLE CREEK OPPOSITE NELSON STREET	11/5/71	<10	20	70
			13/8/71	3000	1100	10,800
B-5	2.0	STORM SEWER OUTFALL EAST OF BOWMANVILLE CREEK AT ALBERT STREET	11/5/71	4400	2200	22,500
			21/6/71	200	210	250
			13/8/71	600	<10	1,500
B-6	2.2	DRAINAGE DITCH EAST OF WAVERLY ROAD SOUTH OF LAWRENCE	11/5/71	<10	<10	<10
			21/6/71		NO FLOW	
			13/8/71		NO FLOW	
B-7	2.1	BOWMANVILLE CREEK BELOW GOODYEAR RUBBER COMPANY LIMITED	11/5/71	30	10	320
			13/8/71	200	100	5,500
B-8	2.21	OUTFALL FROM GOODYEAR RUBBER COMPANY LIMITED	11/5/71	<10	<10	10
			21/6/71	<10	<10	9,400
			13/8/71	<10	<10	<10

TABLE XXII(B) CONT'D.

SAMPLING POINT NO.	STREAM MILEAGE	LOCATION	DATE	STREPTOCOCCUS	FECAL COLIFORMS	TOTAL COLIFORMS
B-19	2.8	OUTFALL FROM R.M. HOLLINGSHEAD CO. 200 FT. NORTH OF SAMPLING POINT NO. B-18	11/5/71 13/8/71	10 <10	<10 100	130 400
B-20	3.0	BOWMANVILLE CREEK ABOVE MILL POND	11/5/71 13/8/71	10 80	30 60	360 270
B-21	3.0	JACKMAN'S CREEK NEAR CONFLUENCE WITH BOWMANVILLE CREEK	13/8/71	1800	700	7,600
B-22	3.05	ROAD CULVERT AT END OF REHDER AVENUE EAST OF BOWMANVILLE CREEK	11/5/71 21/6/71 13/8/71	40	4000 NO FLOW NO FLOW	14,000
B-23	3.1	ROAD CULVERT AT END OF FREDRICK AVENUE EAST OF BOWMANVILLE CREEK	11/5/71 21/6/71 13/8/71	7100	<10000 NO FLOW NO FLOW	140,000
B-24	3.2	JACKMAN'S CREEK AT JACKMAN'S ROAD	11/5/71 21/6/71 13/8/71	30	<10 NO FLOW NO FLOW	40
B-25	3.3	STORM SEWER OUTFALL NORTH-WEST OF FOURTH STREET ON WEST SIDE OF SCUGOG STREET	11/5/71 21/6/71 13/8/71	10 8500	100 290 NO FLOW	170 13,900
B-26	3.5	JACKMAN'S CREEK AT SCUGOG STREET	11/5/71 13/8/71	130	1000 NO FLOW	1,800
B-27	3.45	BOWMANVILLE CREEK AT JACKMAN'S ROAD	11/5/71 13/8/71	10 90	30 10	90 290
B-28	3.8	BOWMANVILLE CREEK UPSTREAM OF MUNICIPAL SANITARY LANDFILL SITE	11/5/71 21/6/71 13/8/71	10 380 50	30 240 10	110 3,000 260

TABLE XXII(B) CONT'D.

SAMPLING POINT NO.	STREAM MILEAGE	LOCATION	DATE	STREPTOCOCCUS	FECAL COLIFORMS	TOTAL COLIFORMS
B-9	2.21	OUTFALL FROM GOODYEAR RUBBER COMPANY LIMITED	11/5/71	20	10	450
			21/6/71	170	340	4,100
			13/8/71	60	490	3,800
B-10	2.22	OUTFALL FROM GOODYEAR RUBBER COMPANY LIMITED	11/5/71	10	<10	70
			21/6/71	140	160	10,600
			13/8/71	410	<100	1,000
B-11	2.23	OUTFALL FROM GOODYEAR RUBBER COMPANY LIMITED	11/5/71	20	10	70
			21/6/71	250	250	4,600
			13/8/71	<1000	20	3,500
B-12	2.23	OUTFALL FROM GOODYEAR RUBBER COMPANY LIMITED	11/5/71	10	20	90
			21/6/71	300	380	3,900
			13/8/71	200	140	2,500
B-13	2.25	OUTFALL FROM GOODYEAR RUBBER COMPANY LIMITED	11/5/71	40	<10	120
			21/6/71	320	220	5,000
			13/8/71		NO FLOW	
B-14	2.3	BOWMANVILLE CREEK 100 YDS. DOWNSTREAM OF HWY. 2 BRIDGE	11/5/71	40	20	140
			21/6/71	230	290	5,000
			13/8/71	160	100	3,100
B-15	2.32	STORM SEWER OUTFALL EAST OF BOWMANVILLE CREEK SOUTHSIDE HWY2 WEST OF QUEEN STREET	11/5/71	150	210	25,000
			21/6/71	11,100	3,000	7,800,000
			13/8/71		NO FLOW	
B-16	2.4	STORM SEWER OUTFALL NEAR SOUTHEAST CORNER OF MILL POND	11/5/71	60	10	50
			21/6/71	2,400	<4	300
			13/8/71	570	60	10,800
B-17	2.9	TRIBUTARY OF BOWMANVILLE CREEK NORTH OF HWY 2 EAST OF COUNTY ROAD NO. 7	11/5/71	10	20	40
			13/8/71		NO FLOW	
B-18	2.78	OUTFALL FROM R.M. HOLLINGSHEAD COMPANY NEAR SOUTHWEST CORNER OF FOUNDRY	11/5/71	30	<10	2,300
			21/6/71	6100	130	17,400
			13/8/71	<10	4	800

ALL ANALYSES REPORTED IN PPM

LAKE ONTARIO
SAMPLES COLLECTED BY:
J. A. CLARKE
A. D. McCONNELL

TOWN OF BOWMANVILLE

WATER POLLUTION SURVEY

TABLE XXIII(A) CHEMICAL ANALYSES

SAMPLING POINT NUMBER	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	TURBIDITY UNITS	CHLORIDE AS Cl	TOTAL KJELD AS N	TOTAL PHOSPHORUS AS P
B-1	MOUTH OF BOWMANVILLE CREEK	4/5/71	2.0	5	6	12	0.66	0.14
		12/8/71	5.5	30	40	12	0.95	0.34
O-1	LAKE ONTARIO 100 FEET EAST OF BOWMANVILLE CREEK	4/5/71	2.5	15	6	12	0.72	0.14
		12/8/71	12.0	80	30	29	2.2	0.26
O-2	LAKE ONTARIO 100 FEET WEST OF BOWMANVILLE CREEK	4/5/71	3.0	15	6	24	0.44	0.082
		12/8/71	5.5	50	40	29	0.72	0.15
O-3	LAKE ONTARIO 1000 FEET EAST OF BOWMANVILLE CREEK	4/5/71	4.0	25	8	22	0.80	0.17
		12/8/71	14.0	110	50	28	2.6	0.30
O-4	LAKE ONTARIO 1000 FEET WEST OF BOWMANVILLE CREEK	4/5/71	2.5	15	6	28	1.9	0.24
		12/8/71	6.0	45	35	29	-	-

ALL RESULTS EXPRESSED AS
PER 100 MLS. OF SAMPLE

LAKE ONTARIO

SAMPLES COLLECTED BY: J.A. CLARKE
A.D. McCONNELL

TOWN OF BOWMANVILLE

WATER POLLUTION SURVEY

TABLE XXIII(B) BACTERIOLOGICAL REPORT

SAMPLING POINT NO.	LOCATION	DATE	STREPTOCOCCUS	FECAL COLIFORMS	TOTAL COLIFORMS
B-1	MOUTH OF BOWMANVILLE CREEK	4/5/71	<10	<10	150
		12/8/71	320	690	2200
O-1	LAKE ONTARIO 100 FEET EAST OF	4/5/71	<10	<10	40
	BOWMANVILLE CREEK	12/8/71	1	80	5000
O-2	LAKE ONTARIO 100 FEET WEST OF	4/5/71	<10	<10	<10
	BOWMANVILLE CREEK	12/8/71	8	10	4000
O-3	LAKE ONTARIO 1000FEET EAST OF	4/5/71	<10	<10	10
	BOWMANVILLE CREEK	12/8/71	1	<10	470
O-4	LAKE ONTARIO 1000 FEET WEST OF	4/5/71	<10	<10	<10
	BOWMANVILLE CREEK	12/8/71	1	10	180

APPENDIX D

INTERPRETATION AND SIGNIFICANCE OF LABORATORY RESULTS

INTERPRETATION AND SIGNIFICANCE OF LABORATORY RESULTS

The analyses employed to assess the water quality of the samples collected during the survey were:

Biochemical Oxygen Demand (BOD), Suspended Solids (SS), Turbidity (T), Nitrate (N), Chloride (Cl), and the determinations of total and fecal coliform organisms and fecal streptococcus organisms.

Bacteriological Examination

The bacteriological indicators of contamination used during the survey were total and fecal coliform organisms and fecal streptococcus organisms. Coliform organisms are most commonly found in human and animal excrement but they can also be found in soil. They are always present in large numbers in untreated sewage and are in general relatively few in number in other stream pollutants. The fecal coliform and fecal streptococcus organisms are more selected indicators of pollution. Fecal coliforms are indicators of human or animal waste. Several investigators have found that in relationship between the number of fecal coliforms and the number of fecal streptococci present in a sample depends on the source of the waste being examined. It has been found that in wastes from humans, there are a greater proportion of fecal coliforms than fecal streptococci. It has been suggested that if the ratio of fecal coliforms to fecal streptococci is 4:1 or greater, the fecal coliform bacteria are from human wastes. When wastes from animals are examined, the results show that the ratio of fecal coliforms to fecal streptococci is usually 0.7 or less.

The Membrane Filter (MF) Technique was employed to obtain a direct enumeration of total coliform organisms (TC), fecal coliform organisms (FC) and fecal streptococcus organisms (FS).

SANITARY CHEMICAL ANALYSES

Biochemical Oxygen Demand (BOD_5) - This test evaluates the loss of dissolved oxygen that accompanies the decomposition of organic matter carried out by organisms. It is an indirect measure of the amount of decomposable matter present and a direct measure of the respiratory oxygen requirements of the living organisms responsible for decomposition. A 5-Day BOD determination with incubation at 20°C is reported. A high BOD_5 is indicative of organic or chemical pollution. In most cases, adequate protection of surface waters should be provided if BOD_5 concentrations in storm sewers, sewage treatment plants and industrial waste discharges do not exceed 15 ppm. In some cases, a much higher BOD_5 concentration in waste discharges can be tolerated while in other cases, a concentration less than 15 ppm could be detrimental. Special situations have to be examined individually. This will ensure that the Biochemical Oxygen Demand from the various sources does not lower the oxygen concentration in the watercourse below 6 - 7 mg/litre and thus make the watercourse unacceptable for various fresh water biota.

Solids and Turbidity - The total solids determination is the sum of the values of suspended solids and dissolved solids. The suspended solids value is the most significant of the solids determination and indicates the measure of undissolved solids of organic or inorganic nature. The effects of suspended solids in water are reflected in difficulties associated with water purification, deposition in streams and injury to the habitat of fish. In most cases, adequate protection for surface waters should be provided

if suspended solids concentration in storm sewer discharges, sewage treatment plant discharges and industrial waste discharges do not exceed 15 ppm.

Clarity is one of the main criteria which the public uses in judging water quality, either for drinking or recreational use. This makes the measurement of turbidity a much more valuable gauge of water quality than the suspended solids test which measures only the weight of particles present in suspension and has little direct bearing on the appearance of the water. Turbidity associated with waste inputs should not exceed 50 Jackson units in warm water streams or 10 Jackson units in cold water streams. There should be no discharge which would cause turbidities exceeding 25 Jackson units in warm water lakes or 10 Jackson units in cold water or oligotrophic lakes.

Nitrates - is the end product of aerobic decomposition of nitrogenous matter. Nitrates occur in the crust of the earth in many places and are the sources of its fertility. Although there are many sources of nitrates, they are rarely abundant in natural surface waters since they are essential fertilizers for all types of plants. The following ranges in concentration may be used as a guide:

Low - less than 0.1 ppm

Moderate - 0.1 to 1.0 ppm

High - greater than 1.0 ppm

Chlorides - are found in most natural waters. They may originate from (1) natural minerals, (2) sea water of contamination of ground water, (3) agricultural partices, (4) human and animal sewage and (5) industrial effluents. A sudden increase in the chloride concentration of the water supply may indicate pollution. Any effluent having an excessive concentration of chlorides should be investigated for possible contamination by sanitary or industrial wastes.

Date Due

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